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TEACHER'S MANUAL

FOR

PRANG'S SHORTER COURSE

IN

FORM STUDY AND DRAWING

BY

JOHN S. CLARK, MARY DANA HICKS, WALTER S. PERRY

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THE PRANG EDUCATIONAL COMPANY
BOSTON, NEW YORK, CHICAGO

IN MEMORIAM
John Swett

EDUCATION DEPT.

TEACHER'S MANUAL

UNIV. OF CALIFORNIA

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EDUCATION DEPT.

AUTHORS' PREFACE.

THIS course of instruction presents, not Form Study alone, not Drawing alone, but Form Study and Drawing as complementing each other, and as together furnishing a means of mental development second to no other study, and indispensable in the education of every child.

FORM STUDY AND DRAWING IN MENTAL DEVELOPMENT.

Recognizing that the development of the mental powers in their natural order, leading to thought, requires not only Perception, but also Expression, the authors have arranged the work of this Course so that pupils shall first observe and study the form of models and objects, and shall then express by Drawing what they have observed in the forms of the models and objects studied. By the presentation of models of type forms, supplemented by familiar objects, the senses are addressed, the attention is awakened, the powers of observation are incited, the mind is stirred to action, thought ensues; Drawing is then introduced, not simply as a means of training the eye and hand, but as a language, by which the pupil not only expresses but impresses his thought; still farther, in the "Making" required in the study of the models and objects, the ability to use the hands is trained and encouraged, the creative faculties are developed, and thus Manual Training, with all its healthful influences, is begun. Pupils going through this course will not only be led, through

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the cultivation of their observing powers, to take a lively interest in the forms of objects around them, but will also become conscious of the power of expressing their ideas of such forms by drawing, whether with regard to their facts as seen in working-drawings, to their appearance as seen in pictures, or to their decoration; at the same time while the eye has been trained to observe, and the hand to draw, the mind has been constantly unfolding through perception, thought, and expression.

DRAWING IN CONNECTION WITH OTHER STUDIES.

It is the hope of the authors that the work in this course may lead teachers and pupils to a free use of Drawing as an aid in other studies, and that through the constant connection, both in the Manual and in the Drawing-books, between type forms and objects familiar to all, teachers and pupils may learn to look upon Drawing not as subsisting in and for itself alone, but as a very important and ready means of awakening and conveying thought in the other subjects of the school curriculum. Drawing should be as much at the command of every teacher and every pupil as writing and speaking, and should be as freely used.

It is hoped, therefore, that teachers will seek every opportunity to carry the drawing out in broad applications in other studies, and will encourage pupils to use it as a means of expression generally in their school work.

JOHN S. CLARK.
MARY DANA HICKS.
WALTER S. PERRY.

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PLAN OF THE SERIES.

THIS series comprises five drawing-books, accompanied by a manual, which covers the work of the five books. Each book contains

DRILL PAGES FOR EXECUTION.
PRACTICE PAGES FOR DRAWING EXERCISES.
DRAWING EXERCISES.
PAGES FOR FOLDING, CUTTING, AND MAKING.

The books are planned with the idea of presenting in a most compact form a drawing-book with paper for practice-drawing, folding, and making, all under one cover.

ARRANGEMENT.

Each drawing exercise or page is accompanied by a practice page facing it. The practice pages are lettered; the drawing pages are numbered. Of necessity the practice page sometimes precedes and sometimes follows the drawing page; for example, Ex. I. on page 1 of the drawing-book is *preceded* by the practice page **D**; Ex. II. on page 2 is *followed* by the practice page **E**. In either case the practice page faces the drawing page, and is of course to be used before the drawing page to which it belongs.

The practice pages are perforated near the inner edge, so that after being used as practice pages they may be readily detached, leaving in the book only the better work of the drawing pages.

ADVANTAGES.

The advantages of the arrangement of the books are noted as follows: —

1. Practice pages and drawing pages being within one cover, the trouble in the use and the care of two books is obviated.

2. The practice page, being arranged to face the drawing page to which it belongs, is always ready for use at the proper time.

3. The practice pages, being perforated near the inner edge, can, after every use is made of them which the Manual requires, be readily removed, leaving the drawing-book to show the result of the pupil's practice and study.

4. Inasmuch as the pupils know that the practice pages are to be removed, and are not to form part of the drawing-book proper, they will be more inclined to work freely and to express their own thoughts. Pupils should never be encouraged to work carelessly, but freedom of movement is of the greatest importance, and the timid child is not inclined to work freely upon the page of his drawing-book if he does not feel very sure of what he is to express and the manner of expressing it. This confidence is to be gained by working upon the practice pages of this series of books.

5. *"Making"* in connection with Form Study and Drawing is of the greatest importance. Many of the perforated pages are to be used for making the various forms suggested, while upon some of the pages patterns are printed for the pupils to cut out and fold to make familiar forms. In these exercises a beginning is made in Manual Training. The forms thus made are to be used as objects of study and as models for drawing.

6. At the beginning of the book and elsewhere, certain pages are given to drill exercises, which while taking but little time are of the greatest importance in producing freedom of movement and confidence on the part of the pupil.

NATURE OF THE WORK.

The exercises require, —

DRAWING FROM MODELS AND OBJECTS.
FROM DICTATION.
FROM WELL-CHOSEN COPIES.
FROM MEMORY.
ORIGINAL DESIGN.
MAKING MODELS AND OBJECTS.

Throughout the series the work is based upon the study of models, common objects, and natural forms. From the first pupils learn to draw from real objects and not from copies of objects. As the sense

of touch furnishes one of the readiest means of ascertaining the form of an object, the lessons are so planned as to require handling of the models and objects by the pupils.

The work is strictly educational, — it deals with the mind; through the study of concrete objects, thoughts are awakened which the hand and eye are trained to express.

CHARACTER OF LINE IN DRAWING.

Particular attention is requested to the character of the lines in the drawing-books. They are broad, soft, gray lines, like pencil lines. They furnish to pupils models of the lines desired from them, — lines showing freedom of movement, ready handling and varying expression. Such lines require a soft pencil, — one not harder than an M grade.

GENERAL DIRECTIONS.

In acquiring a knowledge of Form, there are three stages: Perception, Thought, Expression. Observation of Form requires both Perception and Thought. Expression of Form must of necessity be preceded by Observation. These general directions will therefore be classed under the two heads: Observation of Form and Expression of Form.

OBSERVATION OF FORM.

Models and Objects. — The term Form will be used in this manual as including three dimensions, while Figure or Shape will be used as referring to only two dimensions. Both Form and Shape should be observed first in concrete objects. Hence the exercises in this series of books are based on the use of models and objects. The models are of the simple type forms, and are in both teacher's and pupils' sizes.

For the complete list see description at the end of the book.* The objects chosen are based on type forms, and are such as can be procured with very little trouble.

Every drawing exercise should begin with Observation of the models or objects by the pupils. The directions under this head in each exercise are given to indicate to the teacher the manner in which the pupils should be led to observe (that is, to perceive and to think about) the form of Models and Objects.

Technical terms, which must of course be given by the teacher, should always *follow, not* precede, the observation of the form or figure to which the term applies.

* Where it is practicable, it will be of great advantage to have the pupils well supplied with models, so that each pupil may observe the model for himself through the hand by handling, placing, moving, etc., as well as by the eye.

Judgment of Size and Proportion. — The ability to judge correctly of size and proportion is of great importance, and should be carefully cultivated throughout all form study. An inch (generally expressed 1″) should be made the standard at first, later a foot (generally expressed 1′) may be introduced, and dimensions may be given in feet and inches. The teacher should in some way introduce into every exercise, whether from an object or from a copy, questions leading to judgment of definite length in inches, and also to judgment of the proportion of models, objects, and figures, by the consideration of the *relative* length of edges, of diameters, of profiles, and of lines.

EXPRESSION OF FORM.

Value and Method. — Expression of form is doubly valuable, — on the one hand to the pupil, as a means of completing the study of the form; on the other hand to the teacher, as showing to what degree the pupil has received the idea of a form. There are three ways by which ideas of form can be expressed: by Making, by Drawing, by Language.

Making. — Pupils can express their ideas of the form of a model or object most *completely* by making the model or object; therefore, throughout this series, frequent exercises are given in making objects as a part of the regular work. Modeling in clay is an admirable means of expression, and is not difficult as a class exercise. Directions for the management of clay can be found in the Primary Manual, called "The Use of Models," published by The Prang Educational Company. Teachers should encourage children in "making" simple objects in clay, paper, cloth, cardboard, wood, etc.

Cutting. — This exercise has been successfully introduced into many schools. Its object is, that children may learn to observe figures, not lines; to give skill in using something besides a pencil; to learn by doing; when colored paper is used, to aid in the study of color; to open new lines of thought; to create interest; in short, to more fully educate the child. In some of the exercises it is directed that figures or designs cut from paper be pasted upon the page of the drawing-book. This gives variety to the work. To carry it out, the teacher has simply to pass about the room with a mucilage brush and touch each book in one place, near the centre of the space the figure or design is to occupy; the pupil will then lay the design upon the page and press it down. In no case should a design or a piece of paper be pasted all over the back.

Drawing. — Training in position, pencil-holding, movement, and drawing, as indicated in the following directions, must be systematically pursued.

FREEDOM OF MOVEMENT. — The importance of freedom of movement in drawing cannot be overestimated. It produces lightness of touch, quickness in execution, begets confidence in one's ability to draw, and when acquired by a class of pupils, materially lessens the work of the teacher. Experience among thousands of pupils shows conclusively, that too much stress cannot be laid on the necessity for the early development of freedom of movement. The ability to sketch rapidly and easily an illustration of a thought awakened in the mind cannot be attained without it.

A set of drawing-books, finished as draughtsmen would finish them, rarely indicate the best teaching. It is of far more importance that the child should have opportunity to work for freedom of movement than for straightness of line.

POSITION. — The children should sit on the left half of the seat facing the desk. They should sit erect, feet flat on the floor, the eyes never nearer the paper than is necessary for a clear view of the lines. They should not bend forward unnecessarily, and should learn to work at a distance.

BOOK. — The book should be directly in front of pupil, pushed back on the desk, the long edges parallel to the long edges of the desk. NEVER TURN THE BOOK. To guard against undue rubbing or offsetting of the lines, and also to protect the page from any moisture of the hand, pupils should use a piece of cotton cloth the size of the page. While neatness in work should always be insisted on, bold freehand work should never be sacrificed for immaculate pages in the books.

PENCIL. — The pencil should be of medium grade (Prang's School Pencil M is the proper grade) for all freehand work. It should be sharpened to a round but quite blunt point, and used for drawing only. When the pencil is worn away it should be lengthened by a pencil-holder. Short pencils should not be used.

The pencil should be held lightly *three* or *four inches* from the point, so that it will have the support of the middle finger and be held by the thumb and forefinger. Pencil-holding should be practiced by itself before beginning to draw.

PENCIL. — The pencil should always be held at right angles to the line to be drawn when drawing straight lines, and at an angle of about 45° to the paper.

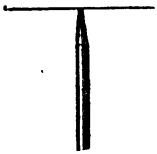


Fig. 1.

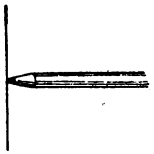


Fig. 2.

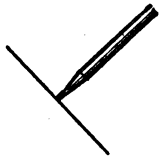


Fig. 3.

Fig. 4.

DRAWING. — Vertical lines should be drawn from top to bottom; horizontal lines from left to right; oblique lines, as a rule, from top to bottom.

Lines at the left and top should be drawn, first as a rule; though all parallel lines should be drawn in succession when practicable.

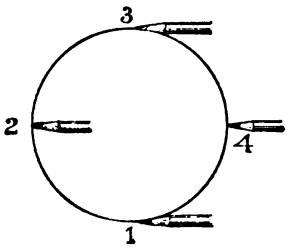


Fig. 5.

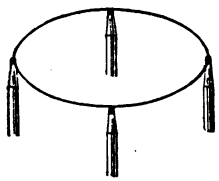


Fig. 6.

Circles and vertical ellipses should be drawn from the lower end of the imaginary vertical diameter, holding the pencil from left to right all the time. In drawing horizontal ellipses the pencil should be held as for a horizontal line. Circles, ellipses, and ovals should be sketched with one sweep of the pencil.

Lines should be drawn continuously, without stopping or retracing.

All curved lines, no matter how short, should be practiced over the printed copy before drawing.

ERASING. — All figures should be sketched with free movement without the use of the eraser. Pupils should erase together as a class, and should not be allowed to use the eraser when lining-in.

BLACKBOARD. — Every opportunity possible for blackboard work should be given to the pupils.

Color. — The use of color in the study of form will be found of great value. Color exercises are therefore suggested for each book. The primary, secondary, and tertiary pigment colors and their combinations are presented in their order and with reference to their relative values.

BOOK I.

Models.

SOLIDS: Sphere, Hemisphere, Cube.
TABLETS: Circle, Semicircle, Square.
NATURAL FORMS: Apple, Plantain Leaf.
OBJECTS: Fan, Shield, Box.

Decorative Forms.

QUATREFOIL, GREEK CROSS, ORIGINAL ARRANGEMENTS.

Making.

TABLET-LAYING: Borders.
STICK-LAYING: Angles, Borders.
FROM A PATTERN: { Sphere, Cube, Box. / Circle, Square, Cross.

Drawing.

PENCIL-HOLDING, MOVEMENT, LIGHT LINES, ERASING, BROAD GRAY LINES.

Language.

(See page 28.)

NAMES OF MODELS AND DECORATIVE FORMS AND THEIR DETAILS. TERMS OF LOCATION, DIRECTION, POSITION, SEEING, LENGTH, DIVISION, ARRANGEMENT.

Color.

THE THREE PRIMARY PIGMENT COLORS.

DRILL EXERCISES.

Drawing-Book, *page* A.

OBJECT. Practice for proper position of pupil and of paper; proper pencil-holding; free arm movement from left to right, from top to bottom, and from corner to corner.

Directions to the Teacher. — Before beginning work in the book, show pupils how to hold their pencils for free movement and drawing. Give practice in movement with the pencil from left to right, and see that *each pupil* holds the pencil properly (see Fig. 1, p. xiii), — the same for movement from top to bottom (see Fig. 2, p. xiii), — and from corner to corner (see Figs. 3 and 4, p. xiii). For movement and for drawing count 1, 2, 3, to keep the children together.

Practice. — Open your book at page **A**, and place it well back on the desk. Find and read the points at the left of the page (*o*, *a*, *b*, *c*, *d*, *e*, *f*). How far apart are they? (If necessary, the teacher gives the distance, *one inch*.)

Sit up straight, and with pencil in hand, held properly, begin at point *a*, and move the hand across the page (without drawing and with the whole arm movement) at least three times; then draw lightly across the page with one continuous movement. Repeat the movement and drawing, remembering to hold the pencil properly and to practice the movement before drawing. *No erasing.*

Read the points at the top of the page (*o*, *1*, *2*, *3*, *etc.*). How far apart are they? Draw from these points down the page, remembering pencil-holding and movement. Draw also from the upper left to the lower right corner, and from the upper right to the lower left corner, with proper pencil-holding and movement. Draw each line with one continuous movement. *No erasing.*

Drawing-Book, *page* B.

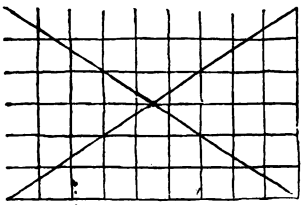
OBJECT. Practice in direction from left to right, from top to bottom; drawing from point to point with free arm movement.

Practice.— On the left half of the page draw lines from left to right, on the right half, from top to bottom, connecting the points given. Practice first pencil-holding, then movement, then drawing, as for page A. *No erasing.*

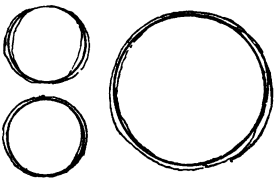
Drawing-Book, *page* C.

OBJECT. Free arm movement, and drawing round and round.

To the Teacher. — Give directions for holding the pencil for movement round and round (see Fig. 5, p. xiii). The pencil must be held the same throughout the movement. Count 1, 2, 3, 4, etc.



D. B., page A, completed.



D. B., page C, completed.

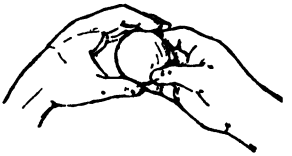
Practice. — Practice movement with proper pencil-holding over the first printed circle without touching it, in the order 1, 2, 3, 4, then draw round and round on the printed circle. Repeat with the other circles. *No erasing.*

EXERCISE I. — Sphere. — Its Outline. — Circle.

MODELS: *Sphere, Circle.*

OBJECT. To study the form of a sphere, to see its outline, and to draw its outline.

Study of the Model by Pupils. — Handle and grasp the model; how does it feel? (The teacher gives the name ***sphere.***)



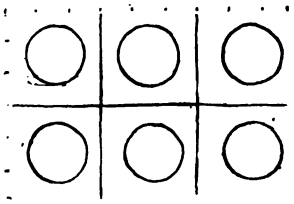
How much of the sphere can you see without turning it? Show with the fingers, and tell what part can be seen, and what part cannot be seen. (*The part toward you*, and *the part away from you.*)

Trace with the fingers on the sphere the outline of the part that can be seen; trace the outline in the air. All pupils trace the outline in the air; what is the shape of the outline? (*Round.*) (The teacher gives the name ***circle.***)

Find a tablet having the shape of a circle, among several tablets of different shapes.

D. B., page D. — Practice page for Ex. I.

Practice. — Draw with free arm movement, a line from *c* across the page, and lines from 3 and 6 down the page, dividing it into six parts.

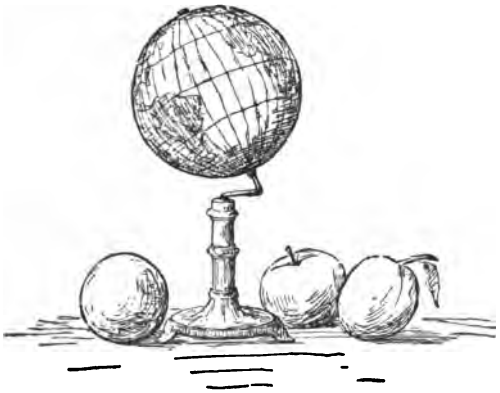


D. B., page D, completed.

In the upper left-hand space, beginning at 1, and moving in the direction 1, 2, 3, 4, 1, 2, etc. (see D. B., page 1), practice the movement for a circle, as large as the space will allow, then draw a circle with one sweep; repeat in the other spaces. Pay special attention to pencil-holding, always pointing the pencil toward the left. *No erasing.*

D. B., page 1. — **Drawing the outline of a Sphere.**

Observation Exercises for Pupils. — What do the pictures in the drawing-book represent? How are the objects represented like the sphere? How are they unlike the sphere? How large is the picture of the sphere? of the ball? of the orange?

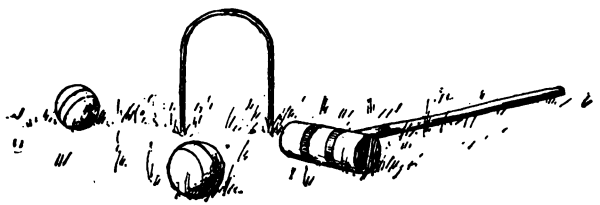


Can you mention other objects spherical in form, — objects in the room, objects in your pockets, objects that you can remember?

Can any one make a sphere at home?

Drawing. — Outline of a sphere represented in the drawing-book by Fig. 1. Draw lightly an outline of a sphere, at the right, of the same size.

In drawing the outline, practice movement first on the printed copy, then over the given points; then draw lightly the circle at one sweep. Correct the circle, erase errors, and complete the outline with a clear, soft, broad, gray line.

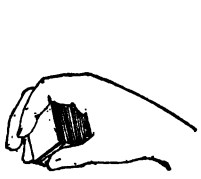
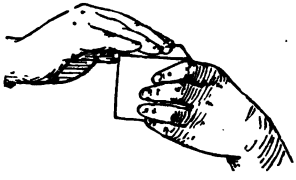


EXERCISE II. — Four Views of a Cube. — Outlines of Different Faces. — Square.

MODELS: *Sphere, Cube, Square.*

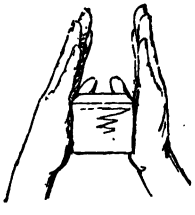
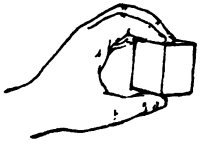
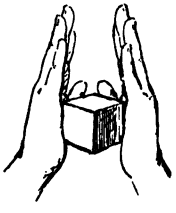
OBJECT. To study the general form of a cube, its faces, edges, and corners; to see and to draw the outlines of different faces.

Study of the Models by the Pupils. — What would you call the new model? (A *block.*) Hold the sphere in one hand, and the block in the other; how does the block feel? (*Sharp, pointed.*) What do you feel? (*Corners, edges.*) (The teacher gives the name ***cube.***)

Hold the cube in the right hand, strike it gently in the palm of the left, and *vice versa.* Pass the fingers over the top of the cube, showing how far it extends; pass the fingers over the front, showing how far it extends. (The teacher gives the name ***face.***)

How many faces has a cube? how many edges? how many corners? How many faces of the cube can you see without turning the cube? Hold the cube so as to see but one face; but two faces, three faces.

Find *upright* faces, called ***vertical*** faces. Find *level* faces, called ***horizontal*** faces. Find horizontal and vertical faces and edges. Are

the edges of the same length? (*The edges are equal.*) How long are they?

Hold the model so as to see but one face; what is the shape of the face? (***Square.***) Find a tablet of this shape.

Observe the front face of the cube, move the fingers on the left and right edges; what is the direction? (*From top to bottom, vertical.*) All trace the direction in the air. Observe and trace the *horizontal* edges.

D. B., page E. — Practice page for Ex. II.

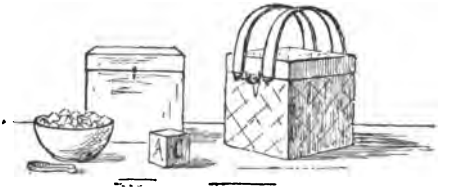
OBJECT. To obtain the pupil's idea of the front face of a cube.

Practice. — Draw upon this page an outline of the front face of the cube, without further direction, making a large drawing. *No erasing.* What have you drawn?

D. B., page 2. — Drawing the outlines of different faces of a Cube.

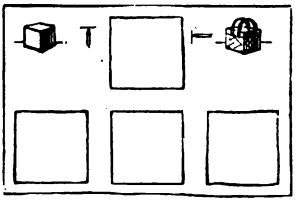
Observation Exercises for Pupils. — What is the name of the model? Open the books. What do the pictures represent?

Mention objects like a cube? Can any one make a cube, or an object like a cube? Point out the front face of the cube; what is its shape? the left face, its shape? the top and right faces, their shape?



Drawing. — The front face of a cube is given in the drawing-book. Draw the left, top, and right faces, using the angles given. In all figures draw by parallels when possible. Therefore the general order in drawing a square is, — left side, right side, upper side, lower side.

This order can be followed readily in drawing the left face, as the angles are all given. Before beginning to draw the top and right faces, place a point for the upper right hand corner of each square.

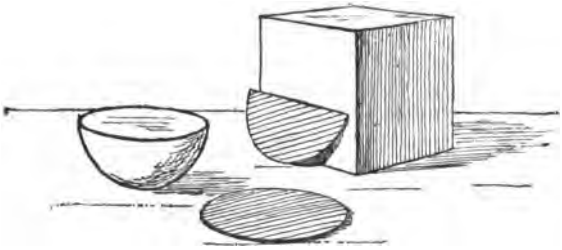


D. B., page 2, completed.

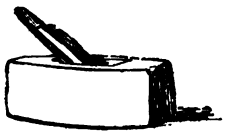
EXERCISE III.—Two Views of a Hemisphere.—Top View, Front View.

MODELS: *Sphere, Cube, Hemisphere, Semicircle.*

OBJECT. To study the form of a hemisphere; to see and to draw the outline of its top view, of its front view.



Study of the Hemisphere by Pupils.—How many faces has this model? (*Two.*) How do they differ? (*One is round and one is flat.*) (The teacher gives the word ***plane,*** the carpenter's plane, and the surface which it makes, being used as illustrations.) What is the model like? (*Half a sphere.*) (The teacher gives the name ***hemisphere.***)



(***View*** from the window noticed; beautiful view recalled; out-door views mentioned.) What view have you in the school-room? (*Indoor view, schoolroom view.*) Place the plane face of the hemisphere on a book, and look directly down upon it. What part of the hemisphere is in view? (*The top.*) What view of the hemisphere have you? (***Top view.***) What is the shape of the top view? (*Circle.*) (***Front view,*** and its shape ***semicircle,*** brought out in the same way.) Find a tablet having the shape of the front view.

(***Curved*** and ***straight edge*** brought out through movement on the edges of the hemisphere and cube and of the semicircle.) Draw the top view and the front view of the hemisphere on the blackboard. See illustration, p. 11. What figures have you made? What kinds of lines are there in the front view? (***Curved*** and ***straight.***)

D. B., page F, left half. — **Practice for Ex. III.**

Observation Exercises for Pupils. — The top view of a hemisphere is given, the front view is required below. How wide is the top view? (*Three inches.*) How wide is the front view? (*As wide as the top view.*) How high? (*Half as high as wide.*) How many inches?

Bisecting. — Turn to a blank page in the middle of the drawing-book. Fold the left edge over to meet the perforations. Crease the fold firmly, and detach carefully on the fold. (The teacher gives the term ***bisect,*** to divide into two equal parts.) Bisect the edges of the part detached in the same way until the term is well understood.

Practice. — Point 1 is given below the top view; place a point at the right to show the width of the front view; practice the movement and draw a horizontal for the *base* of the semicircle.

Place a point in the middle of the horizontal (*bisect* it); then place a point as far above the point of bisection as half the length of the line for the *altitude* of the curve. Beginning at 1, practice movement for a semicircle, and draw it. *No erasing.*

See page 11 for the illustrations of D. B., pp. F and 3 completed.

D. B., page 3. — **Drawing the outline of the front view of the Hemisphere.**

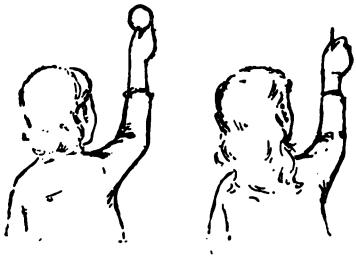
Observation of Sphere, Cube, and Hemisphere by Pupils. — What are the names of the models? What do the pictures in the drawing-book represent? Can you mention objects like a hemisphere? Can any one make and bring to school an object like a hemisphere? Look down on the model to get a top view; what is its shape? Observe the front view in the same manner.

Drawing. — Draw the top view through the given points, first practicing for movement; draw the front view below the top view, using the given points.

EXERCISE IV. — Circular Tablet. — Five Views.

MODEL: *Circular Tablet.*

OBJECT. To study the shape of a circular tablet — to cut it out — to see and to draw its face view, its edge view.



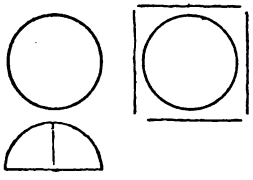
Making and Studying the Model by the Pupils. — Fold page F vertically through the middle, and detach carefully the left half of the page. Cut out the circle printed on the part detached.*

Find the face of the paper tablet, find its edge. Hold the tablet facing you; what is its shape? What would you draw for the outline?

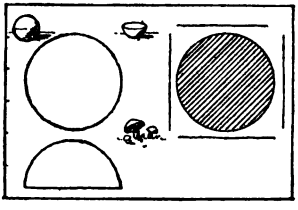
* If the pupils do not have scissors in school, this part of the exercise should be done previous to the lesson, the cutting being done at home.

Look at the edge in various parts to see if the paper is thick or thin,—if it has the same thickness everywhere; hold it so as to look at the edge from the top, from the bottom, from the left, from the right; draw on the board the face view of the tablet, and its top, bottom, left, and right edge views. All this work is intended for pupils.

Fold the nearer edge of the circle over to the farther edge and crease the fold; unfold,—where is the crease? (*From one side to the other, through the middle.*) (The teacher gives the names ***diameter,*** *the measure through*, and ***centre.***)



D. B., page F, completed.



D. B., page 3, completed.

Turn the circle around and fold so that the nearer end of the diameter just touches the farther end; crease, unfold. What have you? (*A circle and two diameters, as on page* F *of the drawing-book.*) How long are the diameters? (*Three inches.*)

D. B., page **F.—Practice page for Ex. IV.**

Practice. — The face view of a circular tablet is printed, and points are given for the top and left-edge views. How long should the bottom and right edge views be? Draw the top, bottom, left, and right edge views. *No erasing.*

D. B., page 3. **—Drawing the edge views of a Circular Tablet.**

Cutting the Tablet. — Before drawing the edge views, cut a circle of paper (blue if possible) at home or at school, and paste it in the drawing-book to cover the printed circle.

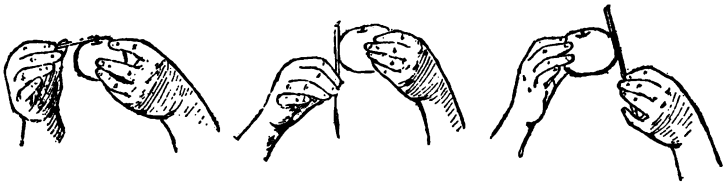
Drawing. — Draw the top view, bottom view, left edge view, right edge view, using the points given.

EXERCISE V.—Apple, from the Object.

MODELS: *Sphere, apple; each pupil brings an apple, irregular in shape.*

OBJECT. To study a familiar object of spherical form; to see and to draw the outlines of an apple; to line in the outlines.

Study of the Models by Pupils. — Span the *sphere* from top to bottom and from left to right; are the distances the same? How do they compare? Span the *apple* from top to bottom, from left to right. How do the distances compare? Hold the apple on a level with the eyes and trace the outline on the apple with the fingers, following the depression at the stem and at the blossom.



Place a pencil on the sphere (the pencil touches at but one point). Place a pencil across the top of the apple; notice where it touches and whether it slants; observe the bottom and the sides in a similar way.

***D. B., page 6.*—Practice page for Ex. V.**

Practice.—Make on the left half of the page a *full size* drawing of the apple just studied, blocking it in, as in Figs. 2–5. Span the apple for height and width; draw light lines to show height, as in 1, 2, Fig. 2, then light lines to show the width, as 3, 4, greater or less than the height as the case may be.

Draw straight lines for the shoulders (see Fig. 3), slant the sides if necessary and draw straight lines for the lower part of the sides. Draw straight lines for the stem and the depression (see Fig. 4), always drawing two lines to show the width of the stem. Draw the curves of the apple over the straight lines. (See Fig. 5.)

Place the apple on a book, held slightly below the level the eye, and look at the farther edge of the book; how much of it can you see? Imagine that you can see the whole of the edge; how much of the apple would appear below the edge? Draw a line for the edge as you see it. This is called the ***table line.*** *No erasing.*

On the right half, block in the same apple again. Erase wrong and unnecessary lines, and finish with broad, soft, gray lines, studying the curves of the apple and drawing with a free movement.

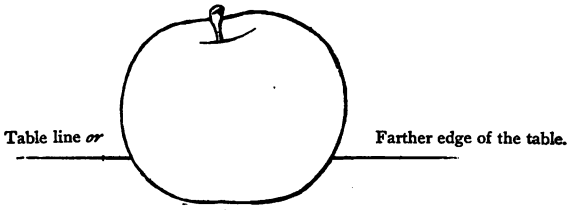


Fig. 1.

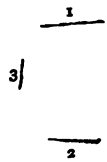


Fig. 2.

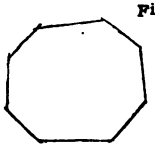


Fig. 3.

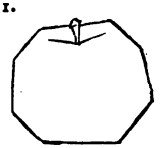


Fig. 4.

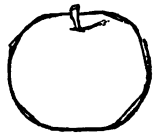


Fig. 5.

***D. B., page 4.*—Drawing the outline of an Apple.**

Observation. — Study the apple carefully again in the manner given above.

Drawing.—Draw its outlines as above, striving to improve on the last drawing. Finish the outlines with broad, soft, gray lines.

EXERCISE VI. — Fan from the Object.

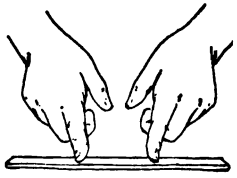
OBJECT. To study the form of an object based on a circle, to see and to draw its outlines, to practice trisection.

Study of the Fan by Pupils. — Look at the fan. Follow with your finger the shape of the fan; what is the shape like? (*Somewhat like a circle.*) Trace the shape again in the air; where is it not like a circle?

Point to the centre of the fan; look now at these distances, — from the top to the centre, from the centre to the upper end of the handle, from the upper end of the handle to the lower end; how do the distances compare?

Point to the middle of the top of the fan, and then move your finger straight down to the bottom of the handle. Suppose such a line were drawn on the fan, how would the part at the left of the line and the part at the right compare in size and shape? (*They would be alike, or* ***equal.***) Describe the line. (*It divides the fan into two equal parts.*) The teacher gives the name ***axis*** for such an imaginary line.

Trisection. — Turn to the half page in the middle of the book; detach it. Look at the upper edge, and think how to divide it into three equal parts, to ***trisect*** it. Use the forefingers of both hands to trisect the edge, and look at the distances carefully. Then fold the paper to get three equal parts; crease the folds and detach the parts.



Place one of the parts vertically on the desk and trisect the left edge, first with the fingers, then by folding.

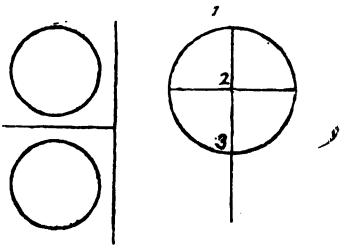
D. B., page **H. — Practice page for Ex. VI. — Dictation.**

Practice. — *The teacher dictates step by step, the class working together.* Trisect the upper edge of the page, and mark the points lightly. From the first point at the left draw a vertical line down the page, with a free movement.

Bisect the left edge of the page. From the point of bisection draw a horizontal to meet the vertical, with free movement. In each of the two spaces at the left, thus made, draw a circle, practicing circular movement over the paper first.

Find the second point of trisection on the upper edge of the page. Make a slight point, half an inch below, and mark it 1. From 1 draw a vertical with a free movement, stopping half an inch from the lower edge of the page.

Trisect the vertical and mark the points of trisection 2, 3. Use the part of the vertical from 1 to 3 as a vertical diameter for a circle. 2 will be the centre of the circle. Place points at the left and right of 2 for a horizontal diameter, and draw it with a free movement. Draw a circle on the diameters, practicing the movement first. *No erasing.*†



D. B., page H, completed.*

D. B., page 5.—Drawing the outline of the Fan.

Observation Exercises for Pupils.—What are Figs. 1, 2, 3? In Fig. 3, which is the axis? There is a curve across the lower part of the circle in Fig. 3; what kind of a curve is it? (*Circular.*) Any part of a curve is called an ***arc.*** How is the point where this arc crosses the axis found? (*By trisecting the middle third of the axis.*) How are the places found for the ribs of the frame? What is the character of the line in the arc and the ribs?

Drawing.—Connect points given by a vertical. Follow the order of drawing given for p. 12. In the upper part of the circle draw the curve for the upper part of the fan. Draw the handle. Add other details. Finish in soft gray lines, noticing the character of the lines in Fig. 1.

Strive to make the drawing like the outline of the fan, which is presented as an object. Perhaps this fan may not be just like the printed fan, but in any case Fig. 3 will suggest the way to study the details.

* By mistake, points, figures, and letters were printed on this page in the first edition of the drawing-book. The page should be blank.

† **Cutting.**—Where pupils have scissors, this fan can now be cut out, adding the necessary width for the handle each side of the vertical and shaping the upper part like Fig. 1, D. B., page 5.

EXERCISE VII. — Shield.

OBJECT. To learn one form of a shield, to study its proportion and shape, to draw its outline.

Study of the Figure by Pupils. — Open your drawing-book at p. 6. What can you tell about the shape of the figure? (*It is higher than it is wide, the two sides are alike.*)

Move your finger down the copy showing the height of the figure; through what part of the figure have you moved? (*Through the middle of the figure.*) What is the name of the line traced by the movement? (*The axis of the figure.*) Sketch the axis on the copy.

Where is the widest part of the figure? (*At the upper horizontal.*) Trace this horizontal with your finger, and note where you cross the axis. Is the width of the figure greater or less than the height?

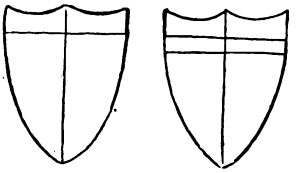
What is the shape of the figure? (The teacher gives the name ***shield.***) What can you tell about the outline of the shield? (*It is made of curved lines, it is not as wide at the top as at the upper horizontal line, it has three points at the top and one at the bottom.*) Where are the points at the top placed? (*One is in the middle, the two outside points are in a straight line with the middle point, they are not quite as far from the axis as the ends of the horizontal are.*)

Trace the upper curve on the left with your finger, — on the right. Repeat several times. Of what does the movement make you think? Trace the long curve at the left side, — at the right. Repeat. Of what does the movement make you think?

In ancient warfare a shield was borne on the left arm, to screen the body from the darts of the enemy. Shields were of different materials and of different forms. The arms which distinguish a family or a state are now generally displayed on the figure of a shield. In the great seal of the United States, the American eagle is represented with one foot planted on a shield, having the upper part blue, with stars upon it, the lower part bearing thirteen stripes, red and white alternating, to represent the thirteen original states. This shield is illustrated on the opposite page, also a simple French shield.

D. B., page 1. — Practice page for Ex. VII.

Practice. — From *a* draw a light horizontal four inches long. Under what point should the right end of the line be? Bisect the line. Draw a light vertical downward from 2, extending as far below the horizontal as the length of the horizontal. Opposite what point should the lower end be?



D. B., page 1, completed.

Practice the movement for the upper left curve on the copy on page 6. Beginning a little at the right of o on page 1, practice the same movement. Draw freely and lightly. Repeat on the right.

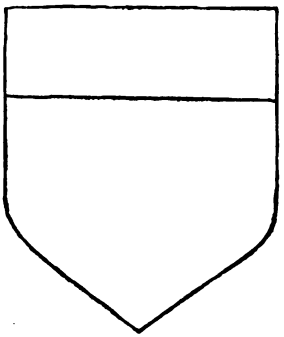
Practice and draw the side curves in a similar manner. Draw the second horizontal half an inch below the upper. *No erasing.*

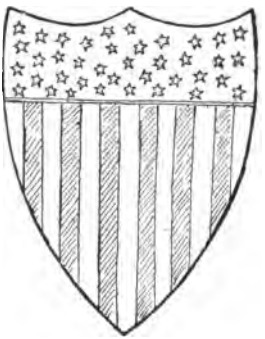
Repeat on the right half of the page, beginning an inch below 5.

D. B., page 6. — Drawing the outline of a Shield.

Observation Exercises for Pupils. — How many inches wide are the shields you drew on page 1? how many inches high? What is the proportion of the width to the height? (*Four inches to five inches,* ***four to five.***) How long is the vertical from the upper horizontal down? from the upper horizontal up?

Drawing. — Connect the points given at the right by a light horizontal. Bisect the horizontal, and bisect its left half, that is, quadrisect the horizontal. Through the middle of the horizontal draw a vertical for the axis of the shield, first deciding where to begin and where to end. Draw the shield, studying Fig. 2 for details.





DRILL EXERCISES.

D. B., page J. — Square, Diameters, and Diagonals.

Practice. Folding. — Fold the leaf at *a;* detach and make two squares. Place one square in front of you, an edge toward you; fold the nearer edge to meet the farther edge. Unfold and fold the other two edges together. Unfold; what can you tell about the creases? (*They go from the middle of one side to the middle of the opposite side; there can be only two in a square; they are equal, they are as long as the sides of the square.*) See Fig. 1. (The teacher gives the name ***diameter.***)

Place the other square in front of you, a corner toward you; fold the nearer corner to meet the farther corner; unfold. Fold the other two corners together. Unfold; what can you tell about the creases? (*They go from one corner to the opposite corner, they cross in the centre, there can be only two in a square, they are equal, they are longer than the diameters.*) See Fig. 2. (The teacher gives the name ***diagonal.***) Keep this square.

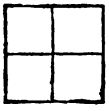


Fig. 1.

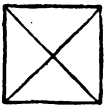


Fig. 2.

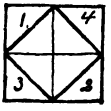


Fig. 3.

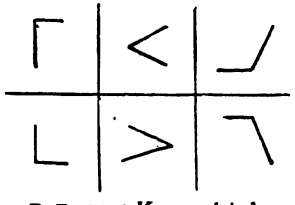
Fig. 4.

Drawing. — A square resting on its side is printed. Bisect its sides and draw its diameters lightly, practicing movement first. Draw lines to connect the ends of the diameters, in the order 1, 2, 3, 4. See Fig. 3. Compare the two squares.

D. B., page K. — Angles, right, acute, and obtuse.

Practice. Folding. — Use the paper square with diagonals, made for page J Fold one diameter. Fold from one corner to the middle. See Fig. 4. Hold with long edge at the top. Compare the direction of edges by movement on the edges (two *horizontal*, one *vertical*, one *slanting*.) (The teacher gives the word ***oblique.***)

Stick-Laying. — Look at the corners of the folded square, compare and describe (*square, sharp, blunt*). Lay these corners with sticks, — one square corner, one sharp, one blunt. Turn the folded square and lay again three corners. (The teacher gives terms ***right angle, acute angle, obtuse angle.***)



D. B., page K, completed.

Drawing. — Draw on page K two right, two acute, and two obtuse angles, from the arrangements made with sticks. The illustration of the page completed shows one arrangement. There are many others which can be made. *No erasing.*

NOTE. — The blank pages in the middle of the drawing-book can be used for folding or for Drill Exercises.

EXERCISE VIII. — Decorative Design. — Borders.

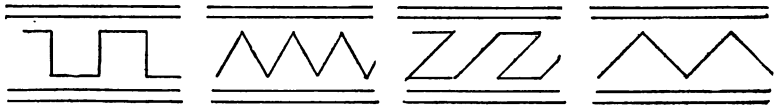
MODELS: *Squares and Sticks for Arrangement.*

OBJECT. To learn what is meant by a border, how to arrange a border, and how to draw it.

Study of Borders by Pupils. — (The teacher shows borders about the room, on wall-paper, on books, on aprons, on handkerchiefs: the pupils find other borders.) Why do we have borders? What figures do you find in the borders? Do you find figures repeated? Do you find any borders that have not figures repeated? Borders are usually made by the repetition of figures, called ***repetition in a straight line.***

What kinds of angles do you find on page L? (Fig. 1 *is a right angle;* Fig. 2, *right;* Fig. 3, *acute;* Fig. 4, *obtuse.*) What kinds of figures? (Fig. 5 *is a square on its side;* Fig. 6, *a square on its corner.*)

***D. B., page* L. — Practice page for Ex. VIII.**



Practice. — Lay with sticks (two and three inches long), borders of right, acute, or obtuse angles. Draw two of these borders on page L, connecting the points given. Illustrations of borders are given here as suggestions to teachers. Arrange tablets or square pieces of paper for another border, placing the squares either on the sides or on the corners. Draw this border in the last space. *No erasing.*

Cut squares of colored paper neatly of the *right size* for the lower border for page 7. Remember that whether the square is on its side or on its corner, it must not be higher from top to bottom than the space between the points.

***D. B., page 7.* — Making Borders.**

Drawing. — Draw in the upper space one of the two upper borders on page L.

Arranging. — Paste in the lower space the colored squares to make a border like the lower border on page L.

EXERCISE IX. — Quatrefoil. — Repetition about a Centre.

TABLETS: *Square, Four Semicircles.*

OBJECT. To learn the shape of the quatrefoil; to see and to draw its outline in a square.

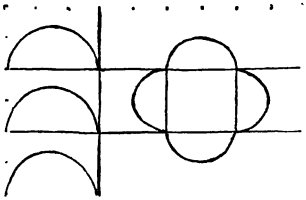
Study of the Figure. — Open your books at page 8. What do you see in Fig. 1? (*A square on its side, and in it a figure having the outline of four semicircles.*) What do you see in Fig. 2? (*A square on its side, and in it the same figure of four semicircles.*) In Fig. 3? (*A circle, and in it the same figure of four semicircles.*) This figure is called a ***quatrefoil,*** meaning *four-leaved.*) What is Fig. 5? (*A quatrefoil in a square.*) How should you think it was made? (*By drawing a square and drawing a semicircle on each side.*) Where is the square? (*In the centre.*) And the semicircles? (*Around the square in the centre.*)*

Look at the lower border on page 7; how are squares placed to make the borders? (*In a straight line, one after the other, not touching.*) How are the semicircles placed in the quatrefoil? (*Around the middle square, and touching it all along the sides.*) This arrangement of figures is called ***repetition about a centre.***

What is a semicircle? (*Half a circle.*) How does its altitude compare with its base? (*The altitude of a semicircle is half its base.*)

D. B., page M. — Practice page for Ex. IX.

Practice. — Draw with free arm movement, practicing direction before drawing — from 3, a vertical down the page — from *b* and *d*, horizontals across the page — a semicircle in each of the three spaces at the left. Make points on the upper horizontal, directly below points 5 and 7. From each of the points thus made draw a vertical downward to the lower horizontal, thus making a square. Upon each side of the square draw semicircles curving outward, first on the upper and lower sides of the square, then on the left and right sides. *No erasing.* What figure have you drawn?



D. B., page M, completed.

* This lesson can be given to great advantage by providing pupils with tablets or paper squares and semicircles, to arrange for Fig. 5.

D. B., page 8. **— Drawing the outline of a Quatrefoil in a Square.**

Observation Exercises for Pupils. — What can you tell about Figs. 1, 2, and 3? Look for a quatrefoil in the schoolroom, on the wall-

paper, in the platform carpet; in iron-work, as stove, registers, desk-standards, etc.; on dresses, aprons, neck-ties, etc.; try to remember any quatrefoil that you may have seen in decoration, or in buildings.

Out of school, try to find a picture having a quatrefoil in it, — in a newspaper. Bring the paper to school, and show the picture, or, if you can be allowed, cut the picture out. Then, having detached page **M**, the picture can be pasted to the margin which remains in the book as an illustration of the way in which a quatrefoil is used.

Drawing. — Points are given for the diameters of a square. Draw the diameters and the square lightly, in the order given for page **M**. Place a point in the centre of each small square. Draw the inner square lightly. Draw the semicircles freely and lightly. Erase the diameters and the inner square and finish the outer square and quatrefoil with broad, soft gray lines.

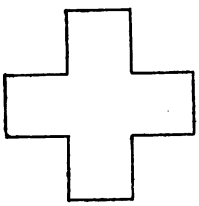
Cutting a Quatrefoil. — Cut a square. Draw the diameters. Mark the points for the inner square. Cut the semicircles freely without drawing.

EXERCISE X. — Greek Cross. — Trisection.

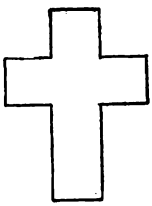
MODELS: *Cross cut from colored paper, Square, having the same dimensions as the cross, cut from manila paper.*

OBJECT. To learn the shape of the Greek cross, to see and to draw its outline.

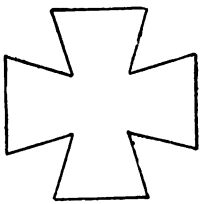
Study of the Paper Cross. — What is the model? (*A cross.*) — Can you draw at the board a cross that is different from this, and tell how it differs? (*The first is alike on all four sides; the second is like the first at the top, at the left, and at the right, but it is longer at the bottom.*)



Greek Cross.



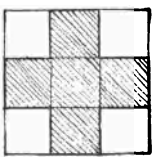
Latin Cross.



Maltese Cross.

(The teacher gives the names ***Greek cross,*** *having four equal arms;* ***Latin cross,*** *having the three upper arms equal, and the fourth, the shaft, longer than the other three.*)

Compare the width of this Greek cross with its height; how do they compare? (*They are equal.*) What figures do you know that are just as wide as they are high? (*Circle, square, quatrefoil.*) Which will help you to draw the outline of the Greek cross? (*The square.*)



(The teacher places the cross on the manila square? and leads the pupils to tell how the Greek cross could be made with tablets or paper squares, as in the case of the quatrefoil, see p. 20; and also that the sides of the square are divided into three equal parts, *trisected*, by the tablets.)

D. B., page N. — Practice page for Ex. X.

Practice.— Free movement and proper pencil-holding. Draw a square of suitable size for the page, by drawing first two indefinite horizontals, then the verticals. Trisect the left side. Draw horizontals across the square. Trisect the upper side. Draw verticals down the square. *No erasing.*

Complete the outline of the cross in broad, soft gray lines.

D. B., page 9. — Drawing the outline of the Cross.

Observation Exercises for Pupils. — What can you tell about Fig. 1? Can you find the figure of a Greek cross in the schoolroom?

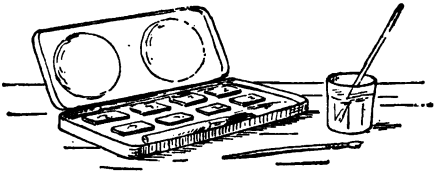
Try to remember any Greek or Latin cross that you may have seen elsewhere.*

Drawing. — Two corners of a square are printed. Draw the square. Trisect the left and upper sides and draw horizontals and verticals, as in Fig. 3. Finish as in Fig. 1.

Cut a square of red paper of the size of Fig. 1. Upon the back of the square trisect the sides and draw horizontals and verticals as in Fig. 3. Cut out the cross and paste it in the drawing-book below Fig. 1, the upper edge of the upper arm of the cross being placed just on the printed horizontal. *Or*, draw very lightly a Greek cross of the size of Fig. 1, using the printed horizontal as the upper line of the upper arm, and color it red.†

* Pupils may be led, if circumstances are favorable, to observe that churches are frequently built on the plan of a cross.

† For exercises in Dimension and Color, giving practice in the use of each of the three primary pigment colors, and also the relative amount of each used in composition of color, see D. B., page R, — for directions, see page 27.



EXERCISE XI. — Cube. — Drawing the Pattern.

MODEL: *Cube.*

OBJECT. To work out the pattern of a cube, to make a hollow cube, to draw the pattern.

Working out the Pattern from the Model. — What is a ***pattern?*** Can you mention something made from a pattern? (*Iron castings, — anything made of cast metal.*) Such things are made from solid patterns; the cube might be a pattern for iron-casting. Can you mention something made from flat patterns? (*Dresses, clothing, — anything made of cloth or leather; dippers, basins, — anything made of sheet metal, tin, iron, etc.; boxes, card-board houses, — anything made of pasteboard or paper.*) What are patterns for?

We want to make a *hollow* paper cube of this size; what must we have so as to get the right form and size? (*A pattern.*) Must it be a solid or a flat pattern? (*Flat.*) Let us try to find out what the shape of the pattern will be. Turn the cube over in your hand; how many faces has it, and what is their shape? (*Six square faces.*) What must your pattern have, then? (*Six squares.*)

Detach the middle page of the drawing-book, and place the cube on it half-way down the page, a little to the left of the centre. Crease the paper around the bottom face; take up the cube. What have you creased in the paper? (*A square, the pattern of the bottom face.*) Put the cube back on the square, fold the paper over it, and crease the other faces.

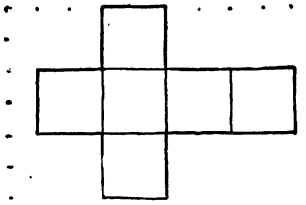
D. B., page O. — Practice page for Ex. XI.

Practice. — From points 3 and 5 draw verticals down the page, and from points *b* and *d* draw horizontals across the page.

The square formed by the crossing of these lines may be taken for the pattern of the bottom face of the cube. How can the pattern for the back face be completed? (*By drawing a vertical for its left edge — an inch from b.*) Draw it. *No erasing.*

(The back and front faces, the right and top faces, developed in a similar way.)

How could the drawing of the pattern have been made with long lines?



D. B., page O, completed.

***D. B., page* S. — Making a hollow Cube.**

What is printed on the page? (*The pattern of a cube.*) What besides? Figs. 2 and 3 are patterns to be put together to make a ball-cover.

(The teacher speaks of the laps on the pattern of the cube and their use in making a cube, — to be pasted so as to hold the face of the cube together.)

Cut out the pattern, Fig. 1, taking care not to cut off the laps; fold it so as to make a cube, and paste it together.

Cut out the patterns Figs. 2 and 3, take them home and use them as patterns for the cover of a ball.

***D. B., page 10.* — Drawing the pattern of a Cube.**

Observation Exercises for Pupils. — What are Figs. 1, 2, and 3? Turn the book sideways; what is the shape of Fig. 1? (*The shape of the Latin cross.*) Suppose that you wished to make a hollow cube open at the top, without any top face, what would be the shape of the pattern? (*A Greek cross.*)

Drawing. — The printed square shows the place of the bottom face in the pattern to be drawn.

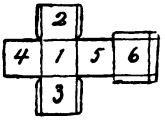
Draw the pattern as in Fig. 1, using the point given at the left and that given above. Draw the long horizontals indefinitely, then the verticals, finishing with the shorter verticals and horizontals. Finish the outline of the pattern in broad, soft gray lines.

EXERCISE XII. — Box made by the Pupil. — Drawing the outline of its front or its side face.

MODEL: *Box made by the pupil.*

OBJECT. To study an object based on a cube; to see and to draw the outlines of one face.

Making the Model, *D. B., page* **P.** — Cut out the pattern printed, cutting along each dark line; fold along each light line. Paste the laps of 2 on the inside of 4 and 5; paste the laps of 3 on the inside of 4 and 5; fold the cover 6 at the front corners; lap and paste, to make the model. What is the form of the box? (*Like a cube, cubic.*) The shape of its faces? (*Square.*) The height of the cover compared with the height of the box? (*One-fourth the height of the box.*)



***D. B., page 11.* — Drawing the outlines of the Box.**

Observation. — What do the pictures represent? (Fig. 1, a *box open, placed so that you can see into it, the corner toward you;* Fig. 2, a *box shut, placed so that you can see the top of it, the corner toward you.*) Place your box to look as in Fig. 1; as in Fig. 2. Hold it up so that you can see only the front face. In drawing the front face, what would you draw first? (*A square.*) What would you do next? (*Bisect the left edge, bisect the upper half for the height of the cover, then draw a horizontal for the lower edge of the cover.*) Turn the box and look at the side face. How would you draw the side face?

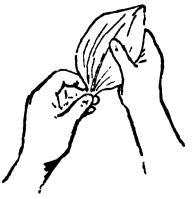
Drawing. — Draw the front face of the box which you have made, making your drawing twice as high and twice as wide as the box. Follow the order of work given above. Finish in broad, soft gray lines.

EXERCISE XIII. — Leaf from Nature.

MODEL: *Plantain leaf about the size of the copy, brought by each child.*

OBJECT. To study a natural leaf, to see and to draw its outline.

Study of the Leaf by Pupils. — Pass your thumb and fingers along the stem of your leaf and out to the point; what do you feel? Turn the leaf over; what do you see running out to the point or ***apex*** of the leaf? (*Ridges* — ***ribs*** — a ***midrib.***)



Lay the leaf upon the desk. Beginning at the *apex* of the leaf with each forefinger, trace around the edge or ***margin*** of the leaf and down the stem. Trace the margin again, but trace with long *straight* lines. Trace the midrib in the same way. How does it look near the apex of the leaf? How far down the stem does it go?

D. B., page Q. — Practice page for Ex. XIII.

Practice. — Place the leaf on the left half of the page. Draw the midrib in straight lines, making it as long as the midrib of the leaf. Draw each margin with three straight lines. Draw the curve for each margin and for the midrib *over* the straight lines, at one sweep, getting the curve by movement. *No erasing.*

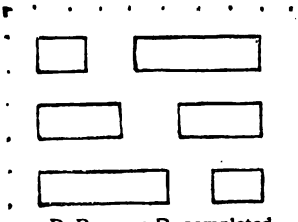
D. B., page 12. — Drawing the outline of a Leaf.

Drawing. — At the right draw *your* leaf, as on page Q (*not* the copy), and finish.

OPTIONAL EXERCISE IN DIMENSION AND COLOR.

D. B., page R.

Dictation. — From *a, b, c, d, e, f* draw light horizontals across the page; from 1 and 8 draw verticals down the page. Beginning 1 inch to the right of *a*, draw a straight line figure 3 half-inches long and 1 inch high; 1 inch below, a figure 5 half-inches long and 1 inch high; 1 inch below, a figure 8 half-inches long and 1 inch high. Draw the same figures in inverse order on the right. See illustration. Color the figures of 3 half-inches yellow, those of five half-inches red, those of 8 half-inches blue.



D. B., page R, completed.

LANGUAGE.

The answers italicized in the text for each exercise are generally abbreviated, and are intended only as suggestions, and *not* as models of the form of answers to be required from pupils. But teachers should give pupils frequent opportunities of applying the following terms and names, and should require *complete* sentences.

Terms of Location, Direction, Position, Seeing, Length, and Division.

LOCATION.— Left, right, top, bottom; left edge, right edge, upper edge, lower edge; upper left corner, upper right corner, lower left corner, lower right corner.

DIRECTION AND POSITION. — From left to right, from top to bottom, from corner to corner; circular, curved, straight; vertical, horizontal, oblique.

SEEING. — The part toward you, the part away from you; top view, front view.

LENGTH. — Long, short, equal; one inch, two inches, three inches, etc.

DIVISION. — Bisect, trisect.

Names of Models, Objects, Arrangements, and Details.

SPHERE, CUBE, HEMISPHERE; face, edge, corner.

CIRCLE, SEMICIRCLE, ARC; centre, diameter.

SQUARE; diameter, diagonal; on its side, on its corner.

ANGLE; right, acute, obtuse.

REPETITION; on an axis, in a straight line, around a centre; border, shield, cross, quatrefoil.

APPLE; stem, blossom.

LEAF; plantain leaf; rib, midrib, apex, margin.

COLOR; yellow, red, blue.

BOOK II.

Models.

SOLIDS: Cylinder, Square Prism, Vase Form.
TABLETS: Circle, Square, Oblong.
NATURAL FORMS: Vegetables, Leaves.
OBJECTS: Envelope, Tumbler, Bowl, Boxes.

Decorative Forms.

SQUARE-LEAVED QUATREFOIL, LEAF FORM, ORIGINAL DESIGN.

Making.

FROM A PATTERN: { Square Prism, Envelope. / Round, Square, and Oblong Boxes.

Drawing.

PENCIL-HOLDING, MOVEMENT, LIGHT LINES, ERASING, BROAD GRAY LINES.

Language.

(See page 54.)

NAMES OF MODELS AND DECORATIVE FORMS, AND THEIR DETAILS.
TERMS OF RELATION, PROPORTION, VIEWS, ARRANGEMENT.

Color.

THE THREE SECONDARY PIGMENT COLORS.

DRILL EXERCISES.

Drawing-Book, *page* A.

OBJECT. Practice for proper position of pupil and of paper; proper pencil-holding; free arm movement from left to right, from top to bottom, and from corner to corner.

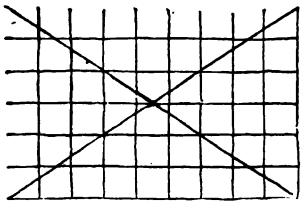
Directions to the Teacher. — Before beginning work in the book, show pupils how to hold their pencils for free movement and drawing. Give practice in movement with the pencil from left to right, and see that *each pupil* holds the pencil properly (see Fig. 1, p. xiii), — the same for movement from top to bottom (see Fig. 2, p. xiii), — and from corner to corner (see Figs. 3 and 4, p. xiii). For movement and for drawing count 1, 2, 3, to keep the children together.

Practice. — Open your book at page A, and place it well back on the desk. Read the points at the left of the page (*o, a, b, c, d, e, f*). How far apart are they?

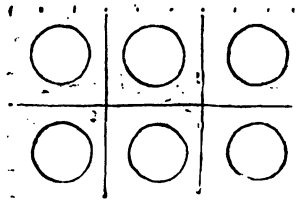
Sit up straight, and with pencil in hand, held properly, begin at point *a*, and move the hand across the page (without drawing and with the whole arm movement) at least three times; then draw lightly across the page with one continuous movement. Repeat the movement and drawing, remembering to hold the pencil properly and to practice the movement before drawing. *No erasing.*

Read the points at the top of the page. How far apart are they? Draw from these points down the page, remembering pencil-holding and movement.

Draw also from the upper left to the lower right corner, and from the upper right to the lower left corner, with proper pencil-holding and movement. *No erasing.*



D. B., page A, completed.



D. B., page B, completed.

Drawing-Book, *page* B.

OBJECT. Free arm movement, and drawing round and round.

To the Teacher. — Give directions for holding the pencil for movement round and round (see Fig. 5, p. xiii). The pencil must be held the same throughout the movement. Count 1, 2, 3, 4, etc.

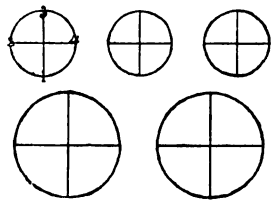
Practice. — Draw with free arm movement, a line from *c* across the page, and lines from 3 and 6 down the page, dividing it into six parts.

In the upper left-hand space, beginning at 1, and moving in the direction 1, 2, 3, 4, 1, 2, etc. (see Fig. 5, page xiii), practice the movement for a circle, as large as the space will allow, then draw a circle with one sweep, always pointing the pencil toward the left; repeat in the other spaces. *No erasing.*

Drawing-Book, *page* C.

OBJECT. Practice in drawing circles on their diameters with free arm movement.

Practice. — Practice movement 1, 2, 3, 4 over the printed circle, holding the pencil long as shown in the illustrations, pp. xii and 30, and in the direction indicated by the illustration, Fig. 5, page xiii. Practice a similar movement on the next two diameters given, then draw a circle with one sweep of the pencil. Repeat on the next two diameters. Practice movement now for a larger circle, on the two diameters at the left, below, and draw the circle with one sweep of the pencil. Repeat on the other diameters. *No erasing.*



D. B., page C, completed.

EXERCISE I. — Three Views of a Horizontal Cylinder.

MODELS: *Sphere, Cube, Cylinder, Circle, Oblong.*

OBJECT. To study the general form of a cylinder; to see the shape of its various views, to draw the views.

Study of the Model by Pupils. — What would you call this new model? (*A roller.*) Take the sphere in one hand and the roller in the other. Pass the fingers around the sphere and along the roller. What do you discover? (*The sphere is round in every direction, the roller is round in only one direction.*) (The teacher gives the terms, ***round face*** for the sphere, ***curved face*** for the roller.)

What kind of faces has the cube? (*Plane faces.*) What faces has the roller besides the curved face? (*Two plane faces.*) Roll the sphere; roll the roller. How do they roll? (*The sphere rolls in any direction, the roller in but one.*) How will they stand best? (The teacher gives the name ***cylinder.***) What is the height of the cylinder? the width? the proportion of the height to the width?

Hold the cylinder upright opposite your eyes; how much of the curved face can you see? (*The part towards me.*) Trace the outline of that part in the air, begin at the bottom of the left side, move up to the top, *straight across* the plane face, down the right side, and across the bottom to the place where you started. Find a tablet having the shape of this outline. What is the shape of the tablet? (*Higher than it is wide.*) (The teacher gives the name ***oblong.***)

D. B., page **D. — Practice page for Ex. I.**

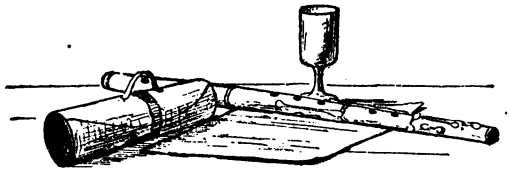
Study of the Model by Pupils. — Hold the cylinder upright opposite your eyes; what view of the cylinder have you? (*Front view.*) What is the position of the cylinder? (*Upright or vertical.*) What is the shape of the front view? (*Oblong.*) Look down on the top of the cylinder; what view have you? (*Top view.*) What is its shape? (*Circular.*) What tablet has the shape of the front view? (*The oblong.*) Of the top view? (*The circle.*) Can you draw these two views on the board? Draw first the top view. Where will

you place the front view? Observe a horizontal cylinder in a similar way to obtain the left end, front and top views.

Practice. — The top view of a vertical cylinder is given. Draw the front view How wide should the front view be? (*As wide as the top view.*) Draw the sides of the front view, obtaining their place by movement downward from the ends of the horizontal diameter of the top view. Using the angle given, draw horizontals, first practicing movement.

The front view of a horizontal cylinder is given. Draw its left end and top views, practicing movement first. Get the length of the top view by movement upward from the verticals of the front view. *No erasing.*

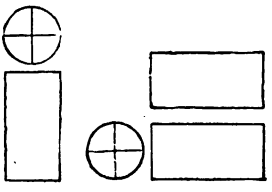
D. B., page 1. — **Drawing the left end and top views of a Horizontal Cylinder.**



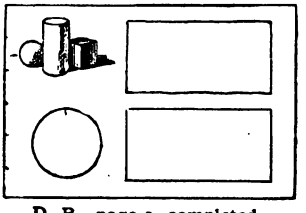
Observation Exercises for the Pupils. — What does the picture in the drawing-book represent? How large is the picture?

Mention objects cylindric (like a cylinder) in form, — objects in the room, objects that you can remember. Can any one make a cylinder at home?

Drawing. — The front view of a horizontal cylinder is given. Draw its left end and top views, according to the directions given for practice above, using the points given. Erase the diameters in the left end view and finish the left and top views.



D. B., page D, completed.



D. B., page 1, completed.

EXERCISE II. — Square Prism. Two Views.

MODELS: *Cylinder, Cube, Square Prism, Square, Oblong.*

OBJECT. To study the form of a square prism, to see the shape and proportion of some of its views, to draw these views.

Study of the Model by Pupils. — How does this model compare with the cylinder? with the cube? How many faces has it? What kind of faces? (*Plane faces.*) What is the shape of the faces? (*Some are square, some oblong.*) How many square faces has it? how many oblong? (The teacher gives the name ***square prism,*** and brings out ***parallel*** faces, — everywhere the same distance apart.)

How high is the model? how wide? What is the proportion of the width to the height? (*1 to 2.*) What is the shape of the front view of the vertical prism? of the top view? Place the prism horizontally and observe it in a similar way as to its end and front views.

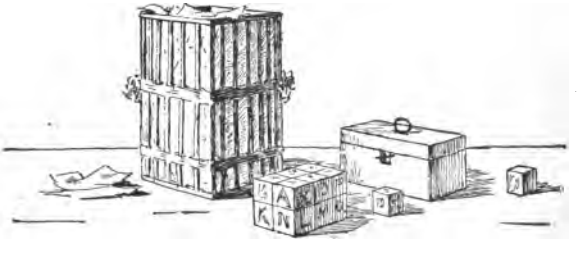
D. B., page E. — Practice for Ex. II.

Practice. — The front view of a square prism is given. Below it, draw the bottom view, using the angle given, — first indefinite verticals, by vertical movement from the sides of the front view, — then horizontals.

At the right of the front view, at the top of the page, an angle is given. Draw the end and front views of a horizontal square prism, — first indefinite horizontals long enough for both views, — then verticals. *No erasing.*

D. B., page 2. — Drawing two views of a Square Prism.

Drawing. — The top view of a square prism is given. Draw the front view, — verticals first, by movement from the sides of the top view, then horizontals.



EXERCISE III. — Oblong Tablet. — Five Views.

MODEL: *Oblong Tablet.*

Making and Study of the Model by Pupils. — Detach page D and cut out the printed oblong. How many faces has this tablet that you have cut out? how many edges? Hold the tablet vertical and facing you: what is its shape? how high is it? how wide? what is the proportion of the height to width? (*2 to 1.*) (The teacher develops ***parallel*** and ***perpendicular*** edges.) Hold it facing you with its long edges horizontal; how high is it? how wide? the proportion of height to width? (*1 to 2.*) Which sides are *parallel* to each other? which *perpendicular?*

Turn it backward until you see only the edge; what will you draw for the edge view? (*A straight line.*) How long? Turn the end toward you; how long is the edge view? Can you draw on the board the face view of such a tablet, and its four edge views?

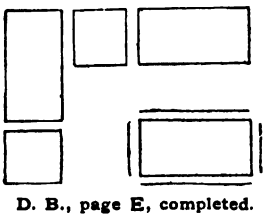
***D. B., page* E. — Practice for Ex. III.**

Practice. — The face view of an oblong tablet is printed, and points are given at which to begin the drawing of the top and left edge views. Draw the top, bottom, left, and right edge views. *No erasing.*

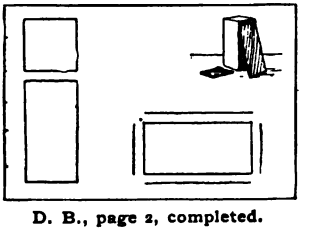
***D. B., page 2.* — Drawing the edge views of an Oblong Tablet.**

Colored Oblong. — Cut an oblong of paper (purple if possible) at home or at school and paste it in the drawing-book to cover the printed oblong, — *or*, mixing blue and red, color the printed oblong purple.

Drawing. — Draw the top view, bottom view, left and right edge views.



D. B., page E, completed.



D. B., page 2, completed.

EXERCISE IV. — Square Prism. — Drawing the Pattern.

MODELS: *Square Prism, Square and Oblong.*

OBJECT. To work out the pattern for a square prism, to make a hollow square prism, to draw the pattern.

Making the Pattern. — (The teacher recalls or develops the idea of a pattern, as suggested in the manual text for Ex. XI., Book I., p. 24, then takes up the square prism.)

How many faces has the square prism? What is the shape of the faces? In what respects are a square and oblong alike? How do they differ? What kind of angles has a square? an oblong? What is a square? (*A square is a figure having four equal sides and four right angles.*) What is an oblong? (*An oblong is a figure having four sides, two longer, two shorter, and four right angles.*)

Of what figures would you make the pattern for a square prism? (*Of four oblongs and two squares.*)

Detach one of the two middle pages of the drawing-book, place the square prism on the page on an oblong face. Turn up the paper around the oblong face of the prism and crease it, to get the shape of the faces in the paper.

D. B., page F. — Practice page for Ex. IV.

Practice. — Draw upon this page the pattern for a square prism as seen in Fig. 1, page 3. Bisect the distances between *a* and *b* and between *d* and *e*. From these points draw horizontals across the page. Bisect the distance between 2 and 3. From the point of bisection and from point 4 draw verticals down the page. The oblong made by the crossing of the horizontals and verticals may be taken for the second oblong face seen in Fig. 1, page 3. Complete the drawing of the pattern, — drawing first all verticals, then all horizontals. Long pencil-holding and free arm movement. *No erasing.*

D. B., page Q. — Making a hollow Square Prism.

What is printed on this page? (*The pattern for a square prism.*) Fold the page on the line *a b*, crease firmly and detach the part containing the pattern. Cut out the pattern, taking care not to cut off the laps. Write your name neatly on an oblong face. Fold the pattern so as to make a square prism, and paste it together.

***D. B., page 3.*—Drawing the pattern of a Square Prism.**

Observation Exercises for Pupils.—What is Fig. 1? Fig. 2? Fig. 3? If Fig. 3 were unfolded, would it be like Fig. 1? Having an oblong given as one face of a square prism, how would you draw the pattern of the prism?

Drawing.—The printed oblong corresponds to the second face in Fig. 1. Draw the pattern as in Fig. 1, using the point given at the left,—first the long horizontals indefinitely, then the verticals, finishing with the short horizontals.

Making a Box.—An illustration is given below of the pattern of an envelope, Fig. 1, and of the same envelope folded, Fig. 2. It will be seen that the tongue seen on Fig. 1, at the left, serves to fasten the envelope when closed, as in Fig. 2. The envelope is pasted across the bottom and up the vertical line to the notch. This device has been patented, and the envelope is used largely by manufacturers and merchants in sending out samples by mail. A box can be made from stiff paper, having the form of a square prism, and a cover like that in Ex. XII., Book I., which can be fastened with a similar device.

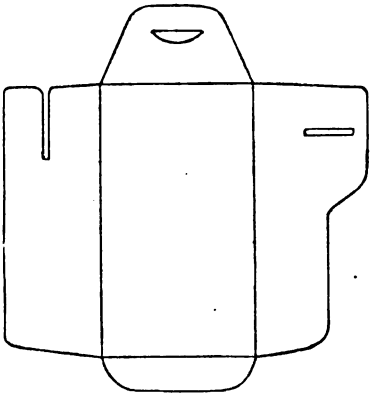


Fig. 1

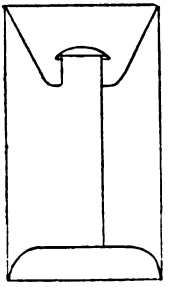


Fig. 2.

EXERCISE V. — Envelope.

MODEL: *Envelope.*

OBJECT. To study an object based on an oblong; to determine its proportion; to draw its outlines.

Making the Model by Pupils. — Turn to page K, detach the page, cut out the printed pattern; fold and paste to make an envelope.

Study of the Model by Pupils. — Hold your envelope vertical, the plain front side facing you; what is its shape? (*Oblong.*) Its size? (*Four inches and a half high, two and a half wide, four and a half by two and a half.*) Its proportion? (*About 4 to 2, we cannot tell exactly.*) How can you draw the envelope of the right proportion? (*By judgment; we know that the drawing should be a little more than half as wide as high; we shall have to judge the rest.*)

Turn your envelope, so that the lapped side, the back, will face you as in Fig. 2, page G. Where is the point of the flap? (*About in the middle of the oblong.*) If you should draw a horizontal through the middle of the oblong, what would you call that line? (*The horizontal diameter of the oblong.*) Where would the oblique laps that start in the right-hand corners meet? (*On the horizontal diameter.*) Draw the horizontal diameter of Fig. 2; trisect the left half-diameter, note that the oblique edges, if continued, would meet at about the second point of trisection. (The teacher gives the term ***semidiameter.***)

***D. B., page* G. — Practice page for Ex. V.**

Practice. — Required on this page two drawings of a vertical envelope, — one of the front, the other of the back.

FRONT. — Two angles are given at the right of Figs. 1 and 2. Draw a vertical connecting the lines. This vertical is for the left edge of the envelope. Determine the width necessary for a drawing that will have the proportion of the model, and draw the vertical for the right edge. Draw the horizontals.

BACK. — One angle is given. Draw an oblong as for the front. Draw its diameter. Trisect the semidiameters. Draw the oblique lines, noting whether they are straight from the corner or whether they are curved or bent. *No erasing.*

***D. B., page 4.*—Drawing an Envelope.**

Observation Exercises for Pupils. — What is Fig. 1? What do the broken horizontals represent? (*The address.*) What is the special purpose of each line of the address? What is the vertical oblong in the corner? What is the actual size of a postage-stamp? Why is it not made of that size in Fig. 1? On what part of an envelope should the postage-stamp be placed? Why?

What is Fig. 2? If you were going to draw such a figure, what line would you draw, to help you in placing the point of the flap and the point of the lower part that is turned up? (*A vertical as a centre line.*)

Write your name and address on the envelope that you made from page K, or on another envelope which you may prefer as a model.*

Drawing. — Two short printed horizontals show the height of the envelope. Beginning near the left margin of the page, draw two indefinite horizontals through the short horizontals. Determine the width necessary to make the drawing of the same proportion as the envelope you have for a model. Draw the left and right verticals. Finish now either as a front view as in Fig. 1, or as a back view as in Fig. 2. If the latter is chosen, draw an indefinite vertical downward through the points beginning just below the title of the exercise, for the centre line of the drawing. Place points on this line where the oblique lines meet it.

* The illustrations show the most common shapes of envelopes. They can be drawn upon the board and pupils questioned, without attempt to influence their choice as to which is the most pleasing shape. This will serve as an exercise in experimental æsthetics, for learning the most pleasing proportion. By collating the results obtained in large numbers of classes, the average preference can be obtained. For this reason the authors will regard it as a favor, if teachers will record the number of pupils in a class preferring each shape, and send the record to "The authors of Prang's Shorter Course," 7 Park Street, Boston

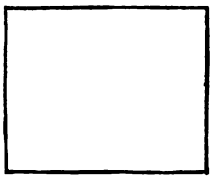


Fig. 1.

Fig. 2.

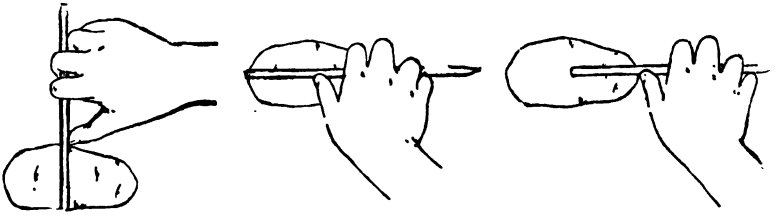
Fig. 3.

EXERCISE VI. — Natural Form.

MODEL: *Each child brings a Potato, or some other vegetable.*

OBJECT. To study a natural form, to see its proportion and outline, to draw its outline.

Study of the Model. — Place the object on a book. With the left hand, lift the book nearly to the level of the eye. With the right hand, measure the height of the object, on the pencil, placing the pencil against the object vertically. Hold the pencil point upward, so that the lower end seems just to cover the *lower* line of the object, and move the thumb until it seems just to cover the *upper* line of the object. Compare this with the width. How do the distances compare? About how many inches is the object from top to bottom? from left to right?



Hold the object at arm's length on a level with the eyes and trace its outline with your finger on the object. Lay your pencil across the top; is the pencil horizontal or oblique? Lay your pencil on the sides; is the general direction vertical or oblique? This study will give the direction of the ***blocking-in*** lines.

D. B., page **H.** — **Practice page for Ex. VI.**

Study of Margins. — Open your reader; what is the space around the printing called? (*The margin.*) Find other margins. You are to make a drawing on page **H**, full size of the object, if you can do so and leave sufficient margin. On a page of the size of page **H** how much margin should you allow? (*Usually not less than an inch.*)

How should the left and right margins compare in width? (*They should be equal.*) If in a drawing the top and bottom margins are made unequal, which should be the wider? (*The top margin.*)

The illustrations show Fig. 1 as a completed drawing, with the stages of drawing it, Figs. 2, 3, and 4. A potato has been selected, because every child can bring one.

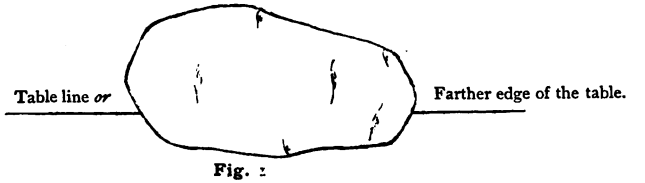


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Practice. — Make a large drawing on this page, full size of the object if possible. Draw light indefinite lines to show the height and width, studying the object carefully for the general proportion and for the direction of the blocking-in lines for the first stage. Add other straight lines necessary to complete the blocking-in. Draw the curves over the straight lines. Add details and the table line.

D. B., page 5. — **Drawing the outlines.**

Study of Details by Pupils. — What is Fig. 1, on page 5? Fig. 2? What details do you notice in Fig. 1? (*The eyes of the potato.*) In Fig. 2? (*The stem and elongated end.*)

Pass your fingers over the surface of your object, — over a rounded part of your desk; what difference in the surface do you notice? (*One is smooth and even or regular, the other irregular.*) Compare the lines in the illustrations on this page with those on p. 4; what difference do you notice?

Drawing. — Follow the directions given for practice. Finish in broad, soft, gray lines, breaking the outlines somewhat to indicate irregularity of surface.

EXERCISE VII. — Bowl.

OBJECT. To study the purpose of a bowl, and also the several forms of bowls; to draw a bowl of a pleasing form, and suited to its purpose.

Observation of Form of Objects as suited to their Purpose. What do you like to drink? From what do you drink? Are tin drinking-cups usually higher than they are wide, or wider than they are high? How is it with tumblers? How do you take hold of a tumbler when you drink? of a tin cup?

Can you think of a tumbler of the same width all the way down? What is the direction of its sides? (*Vertical.*) Of what model does it make you think? (*A cylinder.*) What would you draw for the front view of a cylinder? Can you draw upon the board the front view of a tumbler that is the same width all the way down, and make it of good proportion, that is, so that it will look well and so that you think it would be convenient to drink from? All look at the drawing; what do you think about it?

(The teacher develops the idea of a tumbler wider at the top than at the bottom in a similar way.)

D. B., page 1. — Practice page for Ex. VII.

Practice. — Two drawings of front views of tumblers are to be made on this page. Draw an indefinite vertical centre line for each. On the left centre line draw the front view of a tumbler with vertical sides, making the drawing of the size and proportion that you think pleasing and suitable for a tumbler of the kind.

On the right centre line make a drawing of a tumbler wider at the top than at the bottom, of suitable and pleasing proportion. *No erasing.*

Observation of Form of Bowls as suited to their Purpose. — From what do you eat bread and milk? Are bowls usually higher than they are wide or wider than they are high? (*Wider than they are high.*) Why? Are all bowls alike? Can you draw on the board the front view of the bowl from which you eat? Can *you?* Can *you?*

(The teacher should obtain from pupils if possible as many as six drawings; some will perhaps be like the illustrations below.)

Has the bowl from which you eat a sharp edge? Did you ever see a bowl with a sharp edge? Why do not bowls have sharp edges?

Which do you like better, a bowl with straight sides or curved sides? Should it be narrow or broad at the bottom?

Find a bowl that you like at home. Make a drawing of it and bring it to school.

D. B., page J. — Second practice page for Ex. VII.

Drawing. — Only one drawing is to be made on this page. Draw an indefinite vertical through the middle of the page. On this as a centre line make a drawing of the front view of a bowl of pleasing and suitable size and proportions, — such a bowl as you would like to see and to use.

D. B., page 6. — Drawing a Bowl.

Drawing. — Draw through the middle of the space at the right an indefinite vertical downward. On this as a centre line draw the front view of a bowl, placing the upper horizontal on a line with the upper horizontal of Fig. 1. Make the drawing as large as the space will allow. How wide a margin should you have at the left and right of the drawing? Make the bowl of such a form (with either straight sides or curved) as you think will be pleasing and suitable, — such a bowl as you would like to have.

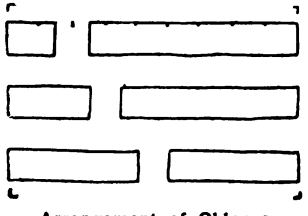
OPTIONAL EXERCISE IN DIMENSION AND IN COLOR.

D. B. — **Middle blank page.**

Dimension. — This Exercise affords practice in drawing oblongs of different dimensions. The six oblongs required are to be 1 inch high, and in length 3 half-inches, 5 half-inches, 8 half-inches, 13 half-inches, 11 half-inches, 8 half-inches, respectively. They are not to be drawn by measuring, but by judgment. This would seem perhaps to be a very difficult exercise to give at this stage; but if taken in the right way, it can be easily done, as will be seen from the directions given in Dictation below.

It is well that pupils should learn how to take advantage of the circumstances in which they are placed. They have no rule to measure with, but by studying the oblong, made by the marginal lines, 6 inches high and 9 inches wide, in D. B., page 6, they can readily place on a blank page of the same size, points for the corners of an oblong, that will approximate very closely to 6″ by 9″. Bisecting and trisecting will give the other points required.

Dictation. — 1. Look at the oblong made by the marginal lines on page 6. How high is it? (*Six inches.*) How wide is it? (*Nine inches.*) Notice how far the corners are from the corners and edges of the page. Place points on the blank page for the corners of such an oblong, and imagine the oblong. Bisect the imaginary left vertical. How long is each half? Trisect each half. Into how many parts have you divided the imaginary vertical? How long is each part? Bisect each inch, and from each point of bisection just made draw a light horizontal to the imaginary right vertical. Trisect the upper horizontal. Trisect each third. How long is each part? Number the inches 1, 2, 3, 4, etc.



Arrangement of Oblongs.

2 Set off 3 half-inches (how many inches?) from the left end of the upper horizontal, and draw a vertical to the next horizontal, making an oblong 1 inch high and 3 half-inches long. One inch below make an oblong 1 inch high and 5 half-inches long; one inch below this, an oblong 1 inch high and 8 half-inches long.

3. On the right of the page, draw oblongs 1 inch high and 13 half-inches, 11 half-inches, and 8 half-inches long, respectively, laying out the oblongs from the right vertical.

Color. — If this is to be used as a color as well as a dimension exercise, the relative values of the primary pigment colors, yellow, red, and blue, can first be recalled as given in the optional exercise for page R, Book I. in the Manual, p. 27; that is, yellow 3, red 5, blue 8.

Questions can then be asked about the primary colors necessary to make the secondary colors, orange, green, and purple. These colors are called secondary because they are made by mixing two primary colors. What colors would you use to make orange? (*Yellow and red.*) The relative values of yellow and red? (*3 and 5.*) If yellow and red are mixed to form orange, what number will express the value of orange? (*8.*) In a similar way the value of green may be developed, — yellow 3, and blue 8, make green 11; also of purple, — red 5, blue 8, make purple 13.

The arrangement of the page can then be laid out according to the Dictation on p. 44, and the oblongs colored according to their extent. Emphasize the relative values, — yellow 3, red 5, blue 8, purple 13, green 11, orange 8.

This lesson can be carried still further if desired, and used to show complementary colors. Each primary color has its complementary, made up of the other two primaries. Thus the complementary of yellow is purple, which is made of the other two primaries. The page when colored shows the complementary of each primary, in a horizontal line with the primary.

YELLOW, Primary; PURPLE, its Complementary.

RED, Primary; GREEN, its Complementary.

BLUE, Primary; ORANGE, its Complementary.

If the values of any primary and its complementary are added, the resultant value is always the same, 16.

In mixing colors which require red, use carmine or lake; vermilion is not a good mixing color.

If colors and a brush cannot be used, the page can be carried out by cutting oblongs from colored paper.

For fuller treatment of color, see Appendix on Color, p.

EXERCISE VIII. — Ornament. — Square-leaved Quatrefoil.

From a Copy.

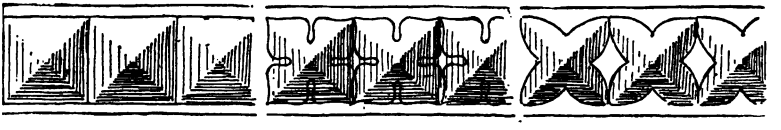
OBJECT. To study a simple ornament based on a square; to draw it enlarged.

D. B., page 7. **— Drawing a square-leaved Quatrefoil.**

Study of the Copy by Pupils. — What is the general shape of Fig. 1? What are Figs. 2 and 3? (*Stages in drawing Fig. 1.*) Describe Fig. 2. (*It is a square with diameters and diagonals.*) How do the diameters divide the square? (*Into four small squares.*)

Find the upper left square in Fig. 3; what figure do you see in it? (*Something like a leaf with a midrib, running to the corner of the square.*) How many of these figures do you find in the square? (*Four.*) How are they placed? (*Around the centre of the square, pointing to the corners.*) Where do these leaf-shaped figures meet? (*On the semidiameters.*) Do they meet in the middle of the semidiameters? (*No, a little nearer to the outside.*) Are the lines that make the leaf-shaped figure straight or curved? Look at the upper side of the square, where the curves of the leaf-shaped figures meet: what shape do the two curves together make? (*A deep curve, a swing, a loop.*)

This flat ornament is from the dog-tooth moulding, used in early English architecture; three forms are illustrated below.



Drawing. — Draw the square, its diagonals and diameters, using the angles given. Place a point on each semidiameter somewhat nearer to the side than to the centre of the square. Practice movement for each curve, first on Fig. 1, then through the point placed for it on the semidiameter, and draw it. Erase diameters and the central part of each side of the square between the leaf-shaped figures. Finish the ornament as in Fig. 1.*

* This ornament furnishes a very good exercise in cutting, as it is so very easily laid out.

EXERCISE IX. — Ornament derived from a Natural Form.

From a Copy.

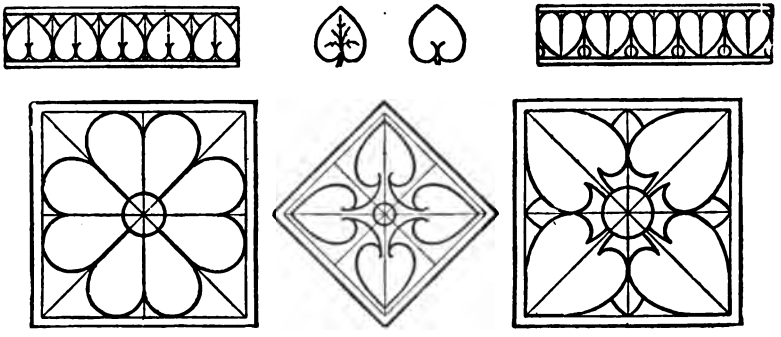
OBJECT. To study an ornament derived from a natural form, to draw it enlarged.

D. B., page 8. — **Drawing an Ornament.**

Study of the page by Pupils. — What is Fig. 2? (*The picture of a morning-glory.*) How do you recognize it? (*By the flower.*) Do you know the shape of the leaf? How many leaves are there in the picture? Look at the lower one on the left; what is the shape? (*Heart-shaped.*) And what is the shape of the upper leaf on the left? What is Fig. 1 like in general shape? Compare Fig. 1 and the leaf?*

Draw the axis of the copy. How does an axis divide a figure? (*Into two equal parts.*) It is therefore called an ***axis of symmetry.*** Notice the beauty of the curves; practice them on the copy with both hands. Can you draw the figure on the board with both hands?

Drawing. — Draw upon the copy a vertical as a centre line and a horizontal through the greatest width. In the space at the right draw a vertical connecting the points given. Draw an indefinite horizontal to show where the greatest width of the figure should be. Practice movement for the left curve and draw with free movement, — repeat for the right curve, — the same for the curves of the stem. Erase construction lines and finish freely.



* The border, Fig. 3, made by repetition, is very suitable and effective for outline embroidery Encourage all efforts at hand work by the children.

EXERCISE X. — Decorative Design. — Units. — Arrangement around a Center.

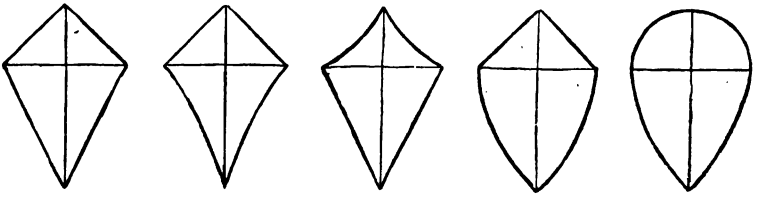
OBJECT. To study a unit, and ways of modifying it; to arrange units around a centre, and, complete the design by a central figure; to draw the arrangement.

Study by Pupils. — What original arrangements did you make in Book I.? (*Original arrangements were made for borders.*) How did you make them? (*By repeating a figure horizontally.*) In what other way can you repeat a figure? (*Around a centre.*) A figure used for repetition in decoration is called a ***unit of design.***

Open your books at page **M.** A very simple unit of design on its construction lines is given. How could you make a different unit on the same construction lines without changing the number of lines in the outline? (*By changing straight lines to curves.*) If you change a straight line to a curved line on one side of the axis of symmetry, what is necessary in order to make a symmetric unit? (*The opposite side should be changed in the same way.*)

***D. B., page* M. — Practice page for Ex. X.**

Practice. — On the construction lines given, a symmetric unit differing in outline from the printed unit is required. Modify the outline by substituting curved lines wholly or in part for the straight lines of the printed unit. The lines may curve in or out, although they should curve but little. Practice movement for the curves before drawing. *No erasing.*



***D. B., page* N. — Second practice page for Ex. X.**

Observation Exercises for Pupils. — Look again at the unit on page **M.** What part of the axis is above the horizontal and what part below? (*One third above and two thirds below.*) How could

you obtain the point where the horizontal crosses the axis? (*By trisecting the axis.*) How long is the horizontal compared with the axis? (*Two thirds as long as the axis.*)

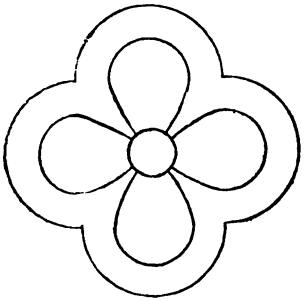
Practice. — Two verticals are given for the axes of two units. Trisect each axis, and through the upper points of trisection draw horizontals two thirds as long as the axis. Upon these construction lines draw two other modifications of the unit on page **M**, by substituting curved lines for straight. *No erasing.*

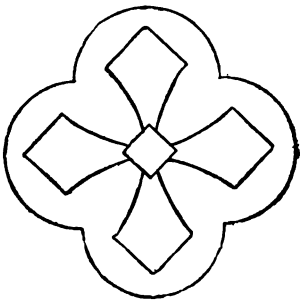
***D. B., page 9.*— Arranging units for a design and drawing it.**

Observation Exercises for Pupils. — What is the shape of Fig. 1? (*The shape of a quatrefoil.*) What do you see within the quatrefoil? (*Units arranged about a centre; — the unit, Fig. 2; — there is also a circle in the centre.*) The figure in the centre of a design, that seems to hold the units together, is called a ***central figure.***

Arrangement. — How long is the axis of Fig. 2? (*Two inches.*) Select one of the units you drew on pages **M** and **N**, and cut out of colored paper four such units, having an axis of two inches. Draw the diameters of the quatrefoil, Fig. 5. Arrange the units to meet at the centre of Fig. 5, and paste them only at the centre. What does the design need to look well? (*A central figure of suitable size.*) Cut one like Fig. 3 or Fig. 4 and paste on the design.

Drawing. — Draw the diameters of Fig. 6. On these diameters draw the design arranged in Fig. 5. Draw the units by opposites. Erase diameters and lines within the central figure. Finish. This design may be colored orange. Orange is made by mixing red and yellow together.





EXERCISE XI. — Boxes. — Two Views Reviewed.

MODELS: *Cylinder, Square Prism, Boxes made by Pupils.*

OBJECT. To recall top and front views by objects made by the pupils.

Review Exercise for Pupils. — What is a vertical cylinder? (*A cylinder standing on one of its plane faces.*) What would you draw for its top view? (*A circle.*) For its front view? (*An oblong.*) What is a horizontal cylinder? (*A cylinder lying on its curved face,* — 1, *from front to back;* 2, *from left to right;* 3, *obliquely.*) What would you draw for the front view of a horizontal cylinder, lying from left to right? (*An oblong.*) For the end view? (*A circle.*) Observe in the same way a horizontal square prism, lying from left to right.

***D. B., page* O. — Practice page for Ex. XI.**

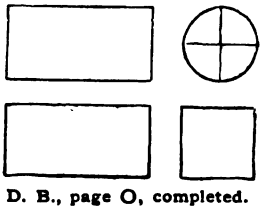
Practice. — The front view of a cylinder, horizontal from left to right, is given. Draw the end view. Continue the horizontals of the front view, — draw a vertical diameter through the centre given, — draw the horizontal diameter, — practice movement for the circle and draw it.

Draw the front and right end views of a horizontal square prism of the same dimensions as the cylinder, lying from left to right. Where should these views be placed to make the page look well? First draw horizontals across the page, — then verticals, for the front and end views. *No erasing.*

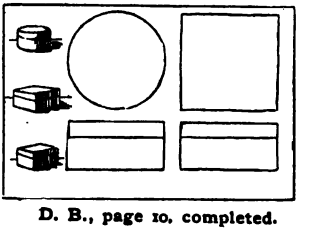
***D. B., page 10.* — Drawing the top and front views of Two Boxes.**

Making. — Cut out the patterns given on page S, and make the three boxes. Decide on the two that you prefer.

Drawing. — The front view of one of these boxes is given. Above it draw the top view of one of those that you prefer. At the right, draw the front and top views of the other box chosen.



D. B., page O, completed.



D. B., page 10, completed.

EXERCISE XII. — Vase Form.

From a Model or Copy.

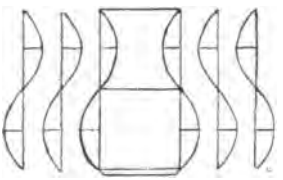
OBJECT. To study a vase form; to practice reversed curves, to draw a vase form.

Study by Pupils. — What is the figure on page 11? (*A vase form.*) What can you say of the curves of the sides? (*They curve first one way, then another.*) Such curves are called ***reversed curves;*** the sides of the form are called ***profiles.*** What is the height of the figure? And the width at top and bottom? The proportion of width to height? (*1 to 2.*) Trace the profiles on the copy with both hands. Can you draw the vase on the board with both hands?

D. B., page P. — Practice page for Ex. XII.

Observation Exercises by Pupils. — What is the purpose of the verticals on the vase form on page P? (*The central line is the axis, the two outside verticals show the general proportion and are construction lines for the profiles.*) Of the short horizontals? (*To show the* ***altitude of the curves.***) Is the vase sharp at the lip?

Practice. — Connect the given points by verticals. Bisect each vertical, and bisect each half; that is, *quadrisect* each vertical. On the verticals at the left, curves like the left profile of the vase are to be drawn; on the verticals at the right, curves like the right profile of the vase. Draw the altitudes of the curves. Trace the movement for each curve on the printed copy, then over the printed vertical, — then draw the curve with unbroken motion. *No erasing.*



D. B., page P, completed.

D. B., page 11. — Drawing the Vase Form.

Observation Exercises for Pupils. — What does the printed horizontal show? (*The width of the vase.*) What should you draw first? (*The axis.*) And then? (*The side verticals; the lower horizontals; quadrisect the verticals; draw the altitudes of the curves.*

Drawing. — Follow the directions given above. Practice movement for each curve, and draw with unbroken motion. Erase construction lines and finish.

EXERCISE XIII. — Leaf from Nature.

MODEL: ***Leaf brought by each Pupil.***

NOTE. — The leaves brought by pupils for this exercise should be not less than three inches from apex to base, simple in form, and not deeply divided. It would be well for each pupil to bring two or three leaves of a kind, so as to study the characteristics of a leaf in more than one example.

OBJECT. To study a natural leaf, to see and draw its outline.

Study of Leaves by Pupils. — A leaf, perfectly developed, has three parts, — the ***blade,*** which is broad and thin; the ***petiole,*** or leaf-stalk; and the ***stipules,*** leaf-like parts, often found at the base of the stalk. Find the blade of your leaf; find the petiole or leaf-stalks; has it any stipules? A good illustration of the parts of a leaf, and also of the principal toothed margins, *serrate, dentate, crenate, undulate,* will be found in the large plate "Margins and Parts of Leaves," belonging to Prang's Natural History Series.

Where is the apex of the leaf? The end of the stem next the leaf-stalk is called the ***base.*** What is the shape of your leaf? Is it broadest at the apex, the base, or in the middle?

Where is the midrib? In the plantain leaf, given in Book I., there are strong ribs; in most leaves the ribs are smaller and are called ***veins.*** Look at the principal veins in your leaf; do they start from the base of the leaf or from the midrib?

Find the best leaf that you have, and lay it on the desk. Beginning at the apex of the leaf with the forefinger of each hand trace around the margin of the leaf and down the stalk in sweeping curves. Trace the midrib in straight lines. Trace the margin again, but this time trace with long straight lines, not more than four on a side, fewer if possible. Trace the principal veins in straight lines.

D. B., page **Q. — Practice page for Ex. XIII.**

Practice. — Place your leaf on page 12. Draw on page Q, the midrib in two straight lines. Block in the leaf; that is, draw it in straight lines, first the left side, then the right side, adding the leaf-stalk and a very few of the principal veins, not more than three on a side, in straight lines.

D. B., page 12. — **Drawing the outline of a Leaf.**

Observation by Pupils. — What is Fig. 1? A linden leaf. Has any one such a leaf? Is the margin of the leaf unbroken, that is, ***entire;*** or is it notched or toothed? Which way do the teeth point, toward the apex, toward the base, or outward?

The margin of a linden leaf is toothed; in the real leaf, the little teeth are quite close together. In making the picture of a leaf, the teeth are only indicated now and then, as in Fig. 1; but although the teeth should be only suggested in a drawing, great care should be taken to retain the characteristic shape and direction of the teeth, whether curved or pointed, whether pointing upward, outward, or downward. If the teeth were all represented in the picture, the attention would be drawn from the beauty of the general shape, and of the strong curvature, and would be fixed on the details of the margin. So also if all the veins were carefully drawn in, the effect of the leaf as a beautiful figure would be lost.

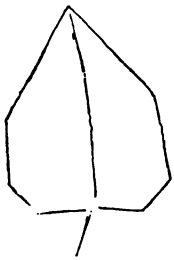


Fig. 1.

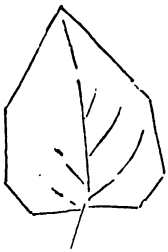


Fig. 2.

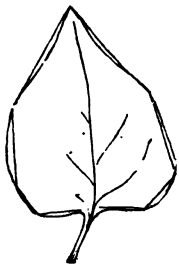


Fig. 3.

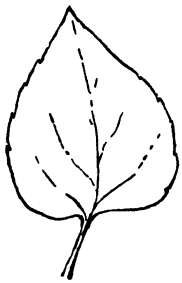


Fig. 4.

The several stages of drawing a leaf are given here: Fig. 1, shape blocked in; Fig. 2, the veins added in straight lines; Fig. 3, the curves drawn; Fig. 4, the leaf completed.

Drawing. — Place your leaf over Fig. 1 in the drawing-book. Block it in as on the practice page. Draw the curves over the blocking-in lines. Erase the blocking-in, and finish in broad, soft lines, indicating a tooth now and then, — or color it.

LANGUAGE.

Teachers should continue to give pupils practice in the use of the terms and names on page 28 as well as of those given below, always requiring *complete* sentences.

Terms of Relation, Proportion, Views.

RELATION. — Parallel, perpendicular.

PROPORTION. — 1 to 2, 2 to 1, 4 to 2, etc.

VIEWS. — Left end view, right end view, bottom view.

Names of Models, Objects, Arrangements, and Details.

SPHERE; round face.

CYLINDER; curved face, plane face.

SQUARE PRISM; parallel faces, perpendicular faces.

VASE FORM; profiles.

OBLONG; diameter, diagonal, semidiameter, semidiagonal.

CURVES; altitude, reversed curves.

ARRANGEMENT; axis of symmetry, unit of design, central figure; square-leaved quatrefoil.

POTATO, SQUASH; eyes, ribs.

LEAF; blade, petiole, stipule; base, veins; entire margin.

COLOR; orange, green, purple.

BOOK III.

In Books I. and II. the exercises are arranged for the study of the facts, appearance, and decoration of form, but without specified reference to these three divisions. In Books III. to V. the exercises are arranged specifically under the three heads, *Construction*, *Representation*, and *Decoration;* and the exercises given under these three heads lead to Working-Drawings and Constructive Design, to Pictorial Drawing and Composition, to the Drawing of Ornament and Decorative Design.

CONSTRUCTION. *Facts of Form.*	SOLIDS: Ellipsoid, Ovoid, Equi. Tri. Prism. TABLETS: Ellipse, Oval, Triangles. MAKING: Cylinder, Equi. Tri. Prism, Toy House.
REPRESENTATION. *Appearance of Form.*	FRUIT, CYLINDER, COVERED BOX. COMPOSITION. Groups of Fruit and Objects.
DECORATION. *Ornamentation of Form.*	ROSETTES; MOORISH ORNAMENT. DECORATIVE DESIGN. Surface Covering, Modification of Units, Flower Form.

Drawing.

Language.—(See page 88.)

Color.—(See pages 74, 75.)

THE THREE SUBJECT DIVISIONS OF FORM STUDY AND DRAWING.

THE study of Form and Drawing includes three distinct yet correlated subjects;—

CONSTRUCTION, the science and art of making diagrams or working-drawings, which give the facts of objects, and from which objects may be constructed.

REPRESENTATION, the science and art of delineating or representing objects as they appear to the eye.

DECORATION, the science and art of producing beauty in ornament.

These subjects require the study of objects and examples, and Drawing is used as a means of expressing ideas gained by such study.

It frequently happens that instruction in Drawing is confined to one or perhaps two of these subjects.

Pupils are sometimes given only the study of the *facts* of form; such pupils become, through this one-sided study, almost insensible to the *appearance* of form and to be wholly uncultivated in the recognition and appreciation of beauty in form and ornament.

In other cases, pupils are given only the study of the *appearance* of objects, without any foundational knowledge of the *facts* of form; they are left completely ignorant of the broad uses of drawing in industry; and know nothing of the elements of beauty in ornament.

In still other cases, the instruction in drawing tends wholly to decorative design, leaving out of consideration entirely the study of objects either as to their facts or their appearance.

Any course of Drawing, therefore, which does not give well-balanced and closely connected instruction in the three subjects, Construction, Representation, Decoration, and which does not also lead to the appreciation of beautiful form in each of the three subjects, can produce only very imperfect and one-sided results.

CONSTRUCTION;

OR, DRAWING AS APPLIED IN CONVEYING IDEAS OF THE FACTS OF OBJECTS.

Of the three subjects ***Construction, Representation,*** and ***Decoration,*** *Construction* is the one upon which the others should be built. It deals with the facts of form, and shows the use which is made of the drawing of these facts, in the world of industry. Its importance, both educationally and practically, cannot be too strongly emphasized.

Construction is the science and art of making drawings which give the facts of objects and from which objects may be constructed. These are called working-drawings, and are necessary to guide the workman in nearly every branch of manufacture.

A Working-Drawing. — A working-drawing is a drawing which gives all the facts of form, size, and structure of an object. Its purpose is to show a workman with accuracy all the facts of an object which is to be made. This object may be one already made or it may exist only in the brain of the inventor or designer.

A working-drawing is, therefore, composed of as many different geometric views of an object as are necessary to the complete understanding of the object.

A *geometric view* shows an object under the simplest possible conditions; that is, as seen with but two dimensions. For such a view, the object is supposed to be placed directly in front of the eye in such a way that two dimensions only are visible; for example, a cube may be presented in such a way that the front face alone — a square — is seen with its two dimensions, height and width.

The different views required in a working-drawing are named from the part represented in the view; thus the front view represents the view obtained by looking directly at the front of the object; the top view represents the view obtained by looking directly down upon the object; and so on with the other views.

In Books I. and II. the facts of form of models and objects as shown in various views, are studied as a means of gaining a complete knowledge of type forms and as leading to observation of form in general. The study of the facts of form is continued in Books III., IV., and V., but the study is further developed so that pupils completing Book V. will be able to make working-drawings from simple objects; and also to read, and to design simple working-drawings.

DRILL EXERCISES.

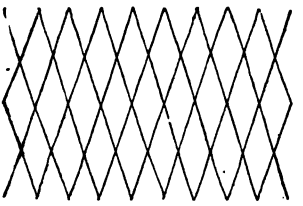
Drawing-Book, *page* A.

(Use Manual Text for Book I. page D.)

Drawing-Book, *page* B.

OBJECT. Practice in drawing oblique lines from point to point with free arm movement.

Practice. — Draw an oblique line from 1 to *c*, draw lines parallel to this from 2, 3, 4, 5, 6, 7, 8, 9, 10 to *f*, *g* and the successive points at the bottom of the page.



D. B., page B, completed.

Draw an oblique line from *c* to *g*, draw lines parallel to this from 0, 1, 2, 3, 4, 5, 6, 7 to the successive points at the bottom of the page and from 8 to 10.

Practice movement for each line before drawing. Draw with one movement. The object is to secure free movement.

EXERCISE I. — Ellipsoid. — Two Views.

MODELS: *Sphere, Ellipsoid, Circle, Ellipse.*

OBJECT. To study the form of an ellipsoid, to see and to draw two views.

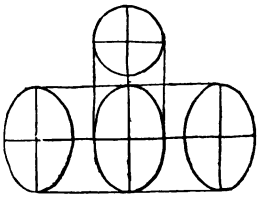
Study of the Model by Pupils. — (The sphere and ellipsoid presented.) Take the two models; in what way does the new model resemble the sphere? In what way does it differ? This model is called an ***ellipsoid.***

Hold the ellipsoid vertical; how much of its face can you see? Trace on the model the outline of the part that you see. Find or cut a tablet having the shape of the outline. Hold the tablet vertical, facing you; how do its two diameters compare? (*The vertical diameter is longer than the horizontal diameter.*) Compare the curve of the outline at the ends of the vertical diameter with the curve of the outline at the ends of the horizontal diameter; can you describe the curve? This figure is called an ***ellipse.***

Hold the *ellipsoid* vertical; what would you draw for the front view? (*An ellipse.*) For the left and right views? (*Ellipses.*) Look down upon the ellipsoid; what would you draw for the top view? (*A circle.*)

D. B., page C. — Practice page for Ex. I.

Practice. — The front view of an ellipsoid is given; the left, top, and right views are required. Draw first the top view. Its centre is given; fix the width of the top view and the place of its vertical diameter, draw three indefinite verticals, practicing movement upward from the front view and drawing downward. Draw the horizontal diameter and fix the length of the vertical diameter. Practice movement for a circle and draw the top view at one sweep.



D. B., page C, completed.

The diameters are printed for the left side view. Draw the diameters for the right side view, using the point given, and obtaining all the points possible by movement from the front view. Practice the movement for an ellipse on the front view, and over the given diameters, then draw the left side view, — the same for the right side view. *No erasing.*

D. B., page 1. — Drawing two Views of an Ellipsoid.

Observation Exercises for Pupils. — What does the illustration in the drawing-book represent? Can you mention something else like an ellipsoid?

Drawing. — The diameters of the front view of an ellipsoid and the centre of its top view are given. Draw the two views according to the directions for practice, page C, and finish the circle and ellipse in broad, gray lines.

EXERCISE II. — Ovoid. — Three Views.

MODELS: *Ellipsoid, Ovoid, Ellipse, Oval.*

OBJECT. To study the form of an ellipsoid; to see and to draw three views of the ellipsoid.

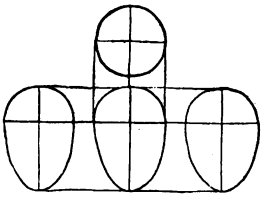
Study of the Model by Pupils. — (Ellipsoid and Ovoid used.) Shut your eyes, take one model in one hand, and one in the other; are they alike? Can you name either one without looking at it? Hold up the ellipsoid; how does the other model differ from the ellipsoid? In what way is it like the ellipsoid? Hold the two models vertical; what is the proportion of the width to the height of the ellipsoid? of the other model? This new model is called an ***ovoid.*** Which end should be at the top in the vertical ovoid? (*The larger end.*) Trace the outline of the vertical ovoid in the air. Notice the beauty of the form, produced by the subtile changes in curvature and by the contrast between the upper and lower part.

Find a tablet having the shape of the outline. Hold it vertical, facing you. Look at the curves of the outline at the top and bottom and at the sides; can you describe the curves?

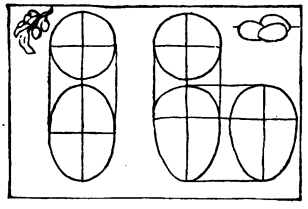
This figure is called an ***oval.*** Where is the widest part of a vertical ellipse? of a vertical oval?

D. B., page D. — Practice page for Ex. II.

Practice. — The front view of an ovoid is given; the left, top, and right views are required. Draw first the top view. Its centre is given; fix its width and the place of its vertical diameter; draw three indefinite verticals, practicing movement upward from the front view and drawing downward with free movement.



D. B., page D, completed.



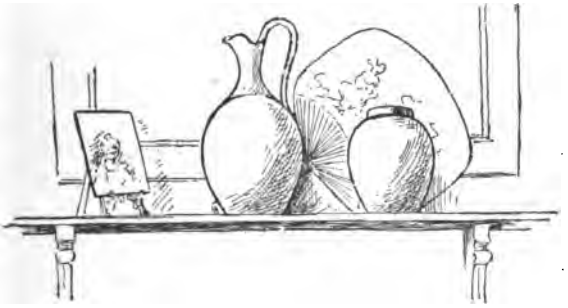
D. B., page 1, completed.

Draw the horizontal diameter and fix the length of the vertical diameter. Practice movement for a circle, and draw the top view at one sweep. Construction lines are printed for the left side view. Draw similar lines for the right side view, using the point given and obtaining all the points possible by movement from the front view. Practice the movement for an oval on the front view and over the given lines; then draw the left side view, — the same for the right side view. *No erasing.*

D. B., page 1. — **Drawing two Views of the Ovoid.**

Observation Exercises for Pupils. — What does the picture in the drawing-book represent? Do you know the story of Columbus and the egg? Upon which end did he make the egg stand?

Can you think of any objects like an ovoid?



Drawing. — The front view of a vertical ovoid is given, also a point for the centre of the top view, and for the diameter of the right side view. Draw the top and right side views, getting dimensions as far as possible by movement from the front view, and finish the circle and oval in broad lines.

EXERCISE III. — Equilateral Triangular Prism. — Drawing the Pattern.

MODELS: *Square and Equi. Tri. Prisms, Square, and Equilateral Triangle.*

OBJECT. To study the form of an equilateral triangular prism, to learn the shape of an equilateral triangle, to make the model, and to draw the pattern of an equilateral triangular prism.

Study of the Model by Pupils. — Place the square prism and equi. tri. prism upright and facing you. How do these two models resemble each other? (*They are each twice as high as wide.*) In what other way do they resemble each other? (*In each model, the ends are parallel to each other and just alike; the faces between the ends are oblongs.*) (The teacher gives the name ***prism*** for both models.)

The prisms are standing upright; upon what part does each stand? (*On the end.*) The part on which a solid rests is called its ***base;*** as a prism can stand upon one end as well as upon the other, each end is called a base. (The teacher develops the name *square prism* from the shape of its bases; also ***triangle*** and ***triangular prism*** through comparison of the bases of the two prisms, and of the corresponding tablets; and ***equilateral triangle*** and ***equilateral triangular prism*** by study of the tablet and the prism and other triangles cut from paper.

Illustrations are given here (for the teacher's use) of the three kinds of triangles named from the relative length of their sides. Fig. 1, an equilateral triangle, the three sides being equal; Fig. 2, an isosceles triangle, having two equal sides; Fig. 3, a scalene triangle, having none of its sides equal.

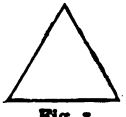


Fig. 1.

Fig. 2.

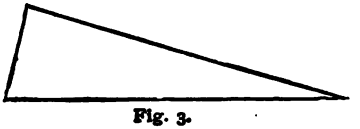


Fig. 3.

Making the Pattern. — (The teacher recalls or develops the idea of a pattern, as suggested on page 24.) How many faces has the equi. tri. prism? What is the shape of each face? What is a triangle? (*A triangle is a figure having three sides and three angles.*)

What is an equilateral triangle? (*A triangle having its sides and angles equal.*) Find two among the tablets; how does the height compare with the length of the sides? What is an oblong? (*An oblong is a figure having four straight sides and four right angles, with only its opposite sides equal.*) Of what figures would you make the pattern of an equi. tri. prism? (*Of three oblongs and two equilateral triangles.*)

***D. B., page* E. — Practice page for Ex. III.**

Practice. — From 2 and 6 draw verticals 6 inches long. Trisect the left vertical. From the upper end of the vertical, from the points of trisection and from the lower end of the vertical, draw horizontals to meet the second vertical, making three oblong faces. Use the middle third of each vertical as the base of an equilateral triangle pointing outward, and draw its sides equal in length to the base. *No erasing.*

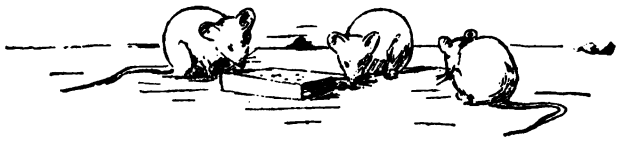
***D. B., page* S. — Making a hollow Equilateral Triangular Prism.**

What is printed on this page? (*The pattern of an equi. tri. prism.*) Detach the page and cut out the pattern, taking care not to cut off the laps. Write your name neatly on an oblong face. Fold the pattern so as to make an equi. tri. prism and paste it together.

***D. B., page 2.* — Drawing the Pattern.**

Observation Exercises for Pupils. — What is Fig. 1? Fig. 2? Fig. 3? Having the length of an oblong face of an equi. tri. prism, twice as high as wide, given, how would you draw the pattern?

Drawing. — The two printed angles show the length of an oblong face. Draw a horizontal to connect the angles. Draw an indefinite vertical from each end of the horizontal. Bisect the horizontal. Point off on the left vertical three distances equal to half the horizontal, and from the points draw horizontals. Complete as above, finishing the triangles and oblongs in broad lines.



EXERCISE IV. — Equilateral Triangular Prism. — Three Views.

MODEL: *Equi. Tri. Prism.*

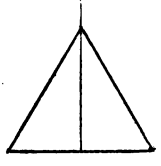
OBJECT. To study three views of the horizontal equi. tri. prism, to draw the end, front, and top views.

Study of the Model by Pupils. — Place the equi. tri. prism on the desk, horizontal from left to right; what would you draw for the left end view? (*An equilateral triangle.*) What would you draw for the front view? (*An oblong.*) How long should the oblong be? (*Twice as long as the width of the left end view at the base.*) How high should it be? (*As high as the left end view.*)

Look down on the prism; how many long edges can you see? (*Three.*) How wide does the top view look from left to right compared with the front view? how wide from front to back? What would you draw for the top view? (*An oblong with its long diameter.*) How long should this oblong be? (*As long as the front view.*) How high should it be? (*As high as the base line of the left end view is long.*) Compare the top and front views; how do they differ?

D. B., page **F. — Practice page for Ex. IV.**

Observation Exercises for Pupils. — Stand the equi. tri. tablet facing you; on what part does it rest? (*On an edge, on the base.*) Can you think of a name for the top of the triangle? (*The point, the apex.*) This is also called ***vertex.*** How far is the vertex from the *ends* of the base? (*As far as the length of the base.*) What is the height of the triangle called? (*Its altitude.*)



Can you draw an equilateral triangle on the board? How should the sides of an equilateral triangle compare in length? Draw a horizontal for the base of the triangle and bisect it. Draw an indefinite vertical to the point of bisection. On this vertical place a point for the vertex, as far from the *ends* of the base as the length of the base, and draw the two sides.

Practice. — The left end, front and top views of an equi. tri. prism, placed horizontal from left to right, are required. A horizontal is printed for the base of the left end view. Draw the left end view according to the directions just given.

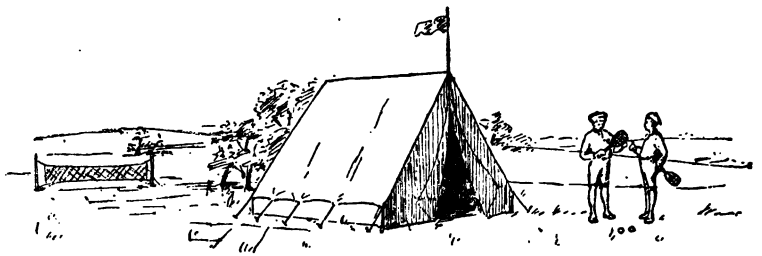
From the vertex and the base draw indefinite horizontals to the right. Draw the verticals for the front view, using the given angle and judging the proper length of the oblong.

Draw the verticals for the top view, using the given angle. Judge the proper height of the oblong, and draw the three horizontals needed.

D. B., page 3. — Drawing Three Views of an Equilateral Triangular Prism.

Observation Exercises for Pupils. — What does the picture in the drawing-book represent? What can you see or mention that is like an equi. tri. prism?

Drawing. — Follow the directions for the practice page. Complete with a broad, soft, gray line.



REPRESENTATION;

OR, DRAWING AS APPLIED IN REPRESENTING THE APPEARANCE OF OBJECTS.

Representation is the science and art of delineating or representing objects as they appear to the eye. The study of the facts of form of objects in Construction prepares the pupil for the study of the appearance of objects in Representation. Representation is the complement to Construction, and follows it legitimately.

The principles of the two subjects are, however, widely different. For Construction requires two or more *geometric* views, each from a different stand-point, while Representation requires one *pictorial* view from a single stand-point.

Before attempting exercises in Representation with pupils, it is necessary to make plain to them that the *appearance* of the form of an object, seen from one stand-point, may be very different from the facts of its form. The fact must be recognized that instruction in drawing the appearance of objects must relate primarily to instruction in *seeing*, and that pupils fail in drawing the appearance of objects more from inability to *see* than from inability to draw. In general all persons not trained to habits of correct *seeing* are predisposed toward drawing or representing the appearance of objects according to the idea of the facts of the form which the sense of touch has fixed in the mind.

Nearly all the principles in this subject can be learned by the study of the appearance of type forms, the simplest geometric solids. They are:

1. Cylindric forms. 2. Rectangular forms.

Why the Appearance of Objects differs from their Facts.— The appearance of an object depends on two conditions:

1. Its position in regard to the observer; 2. Its distance from the observer.

Position affects the apparent FORM *of an object; distance affects the apparent* SIZE.

The apparent form of any object, except a perfect sphere, varies with every position in which it is placed in regard to the observer.

Hold a cube so that you can see but one face; what is the shape? Hold it so that you can see two faces; what is the shape of the cube as you see it?

The apparent size of an object decreases as its distance from the observer increases.

The effect of distance on the apparent size of an object is a matter of common observation. Take a vertical measurement on the pencil (see p. 72) of an object at a distance of three feet, and again at a distance of ten feet.

As a preliminary to the exercises in Representation, practice can be given in Measurement on the pencil, as given in the Manual text for Exercise VII. p. 72, and as illustrated on the second page of the cover of the Drawing-Book.

The object of the Exercises in Representation in Book III. is to lead pupils to see, and to express orally and by drawing;

1. *That a face view of a circle is always a circle.*
2. *That an edge view of a circle is always a straight line.*
3. *That an oblique view of a circle is always an ellipse.*
4. *That the more oblique the view is, the more nearly the ellipse approaches a straight line.*
5. *That the less oblique the view is, the more nearly the ellipse approaches a circle.*

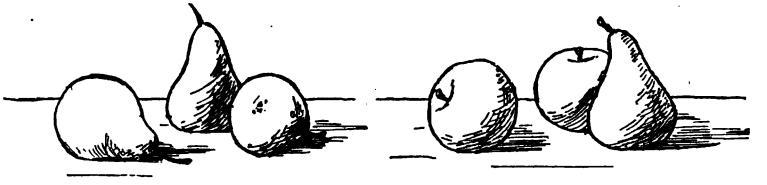
EXERCISE V. — Group of Fruit.

From natural Fruit.

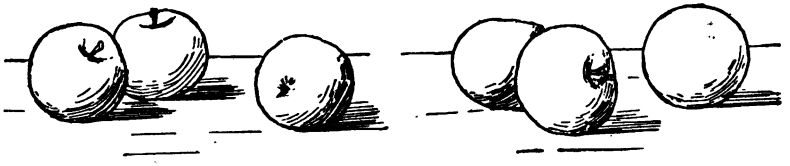
OBJECT. To arrange a group of fruit; to study its appearance; to draw its appearance.

Arrangement of a Group by Pupils. — Let three pupils stand in a *row;* let three others stand in a group. What is the difference between the row and the group?

Arrange a ***group*** of fruit, of two, or at the most three, very simple forms, so that the effect will be pleasing. Remember that the effect desired in a group is very different from the regularity allowed, and to a certain extent demanded, in decoration.



(1) Choose one for the principal object, and, generally, place it centrally but not exactly in the centre; (2), do not place the other objects in a straight line with the principal object; (3), try the effect of placing the objects so that if the centres of their bases were connected an irregular figure would be made; (4), place them as if they were good friends and belonged together, and (5), so that they will appear at rest. But remember (6), that the objects should not have the same positions, that is, their axes should not be all upright or all horizontal; they should not be parallel or at right angles to each other; and they should not present exactly the same faces; and (7) one of the objects should be partially hidden behind another, even if there are no more than two objects in the group. Look now (8), to see if in the group that you have made, the objects will appear of the same height when drawn. If so, change them, for the effect will not be pleasing.



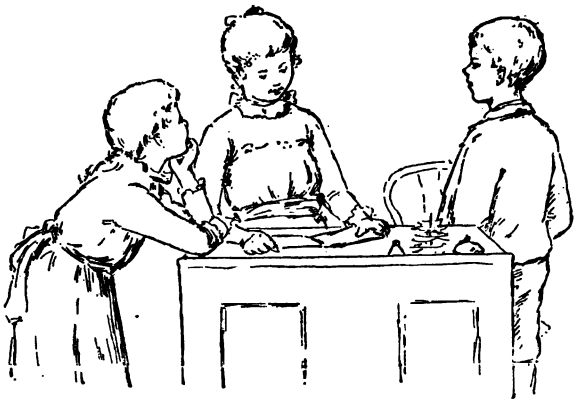
D. B., page **G. — Practice page for Ex. V.**

Practice. — Having arranged a group, obtain the proportion of the width to the height of the group, by measurement on the pencil, as illustrated on page 40. Indicate by light verticals and horizontals the space to be occupied by the group, making it of a suitable size for the page and of the proper proportion. Block in first the principal object in the group and then the others. Draw the table line, studying to place it well. Draw the curves over the blocking-in lines. *Do not erase or finish.*

D. B., page 4. **— Drawing the Outlines of a Group.**

Observation by Pupils. — Study the groups in the drawing-book. If you connected the bases of the objects in Fig. 1, what kind of a figure would you have? In Fig. 2? Describe the position of the axes of the objects with relation to each other in each group.

Drawing. — Follow the directions given for page G. Correct, erase wrong lines and finish.



EXERCISE VI. — Appearance of a Cylinder below the Level of the Eye.

MODEL: *Cylinder made by the Pupils.*

OBJECT. To make a hollow cylinder, to study its appearance below the eye, to draw the appearance.

Making the Model. — Detach page H and cut it on the printed line. Roll into a cylinder, lap the ends half an inch and paste them together.

Study of the Model by Pupils. — What is the shape of the top view of a cylinder? of the front view? Remember that these terms, *top view*, *front view*, etc., refer always to the ***facts*** of an object, — to the object as it is when measured, and not to its ***appearance.*** The cylinder is to be studied in this Exercise as it *appears.* Hold the cylinder just made at *arm's length*, vertical, with the top (1), on a level with the eye; (2), two inches below the level of the eye; (3), four inches below. Repeat.

Hold it now four inches below the eye, and look at the top; what is the shape of the top as it appears to you? (*The shape of an ellipse.*) Raise the cylinder two inches; does the appearance of the top change? (*The top appears narrower from front to back.*)

Hold the cylinder vertical, at arm's length, somewhat below the eye; how much of the lower edge can you see? (*One half.*) What is the appearance of the lower edge? (*It appears to curve downward.*) Is the curve that of a circle or that of an ellipse? If you could see the whole of the appearance, what figure would it be like? Compare the front half of the upper edge and that part of the lower edge which is visible; which appears to curve the more? (*The lower.*) What is the proportion of the height to the width of the cylinder?

***D. B., page* 1. — Practice page for Ex. VI.**

Practice. — Hold the cylinder vertical at arm's length, two inches below the level of the eye; and study its appearance and proportion. On the upper part of the page or on the desk, lay a pencil or a strip of paper to represent the level of your eye. Considering this as the level of the eye, draw the cylinder as it appears to you, making a large drawing in the centre of the page.

D. B., page J. — Practice page for Ex. VI.

Practice. — Three ellipses differing in proportion are printed. Practice movement, see Fig. 6, page xiii, on the upper ellipse, moving in the order 1, 2, 3, 4. Repeat the movement over the first printed diameters, and draw an ellipse with one sweep of the pencil. Following the same order, draw ellipses on all the printed diameters. *No erasing.*

D. B., page 5. — Drawing the Appearance of the Cylinder.

Observation Exercises for the Pupils. — Look carefully at the printed copy; hold your cylinder vertical at arm's length, raising or lowering it until the top appears to you like the ellipse on the printed copy; observe also the curve at the bottom. Note where the profile lines meet the ellipses; do they seem to cut the curve or to touch it? When a line meets a curved line so that it touches it, but if continued would not cut it, there is said to be a ***tangential union.***

Drawing. — On the *printed copy* draw a central vertical, complete the lower ellipse, and draw the diameters of the ellipses.

Connect the points given at the right, for the central line of the drawing to be made. Indicate the width of the cylinder by indefinite verticals, and draw lines for the long diameters of the ellipses. Determine the width of the ellipses on the central line, and draw the appearance of the cylinder, finishing it in broad lines.

EXERCISE VII. — Covered Box. — Appearance below the Level of the Eye.

From an Object, if possible.

OBJECT. To study the appearance of horizontal circles below the eye as seen in a cylindric object: to draw the appearance.

Measurement on the Pencil by Pupils. — (The teacher draws upon the board vertical oblongs of different proportions. If the schoolroom is wide, it will be better to have several such oblongs, some at the left, some in the middle, and some at the right end of the board. The teacher gives the following directions, and sees that each is intelligently carried out before proceeding to the next, explaining that the measurement to be taken first is the width of the oblong, next the height of the oblong. See illustration on the second page of the drawing-book cover.)

Position, and Practice in Holding the Pencil for Measurement. — Sit well back in the chair, with head erect and shoulders resting firmly against the back of the chair.

Grasp the pencil in the middle with the fingers, leaving the thumb, and, as occasion demands, the forefinger, free to move along the pencil (see illustrations, page 40).

Hold the pencil horizontal and *parallel* to the line of the eyes, at arm's length, with the point to the right. Drop the hand to rest. Hold the pencil vertical (not inclining either backward or forward, either to the right or the left), at arm's length, with the point downward.

Measuring Horizontally. — Sit back in the chair, close one eye, and hold the pencil horizontal, at arm's length, with the point to the right, and so that the left end appears to be just at the left side of the form or figure to be measured; move the thumb until it appears to be just at the right side of the form or figure (Fig. 1, second page of the drawing-book cover).

Measuring Vertically. — Hold the pencil vertical, at arm's length, with the point downward, at such a height that the upper end of the pencil appears to be exactly on a line with the upper side of the form or figure to be measured; move the thumb up or down the pencil until the thumb appears to be on a line with the lower side of the form or figure.

Comparing two Measurements. — Remember always to take the *same* position (back in the chair, pencil at arm's length) for any two measurements that you wish to compare; *and that the measurements give proportion only, not size.* Take the shorter measurement on the pencil, *keep it by holding the thumb fixed;* turn the pencil and compare this measurement with the longer, by seeing how many times the shorter measurement can be repeated in the longer.

Find the proportion of width to height in the various oblongs. (The teacher places the waste-paper basket where all can see it.) Measure the height of the basket and its width at the top; which is greater?

Study by Pupils of a Cylindric Object — a Covered Box. — Measure the height and width of the appearance on your pencil; how does the height of the appearance compare with the width? What is the appearance of the top? Measure the width of the top from front to back, and its width from left to right on your pencil; how do they compare? What is the appearance of the lower edge of the cover? Of the lower edge of the box?

***D. B., page* K. — Practice page for Ex. VII.**

Practice. — Obtain the proportion of the height to the width of the box by measurement on the pencil. Draw according to the directions given for drawing the cylinder. Make a large drawing.

***D. B., page 6.* — Drawing the appearance of the Box.**

Observation Exercises for Pupils. — What kind of a box is represented in the drawing-book? What is the actual shape of its top view? (*A circle.*) What is the appearance of the top in the picture? (*Like an ellipse.*) Why was it not made the actual shape?

Drawing. — Follow the directions for the practice page. Make a large drawing and finish it in broad, soft lines, drawn with continuous movement.

OPTIONAL EXERCISES IN DIMENSION AND IN COLOR.

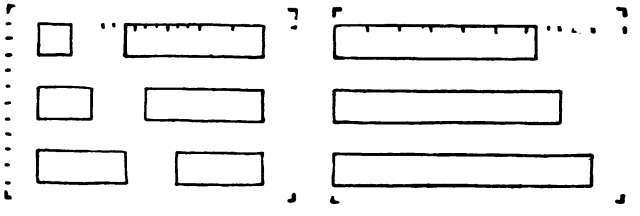
The two blank pages facing each other in the middle of the book are to be used for these exercises. They may be exercises in Dimension only, or in Dimension and Color combined.

Dimension. — These exercises afford practice in drawing oblongs of different dimensions. The six oblongs required on the left page are to be 1 inch high, and in length 3, 5, 8, 13, 11, and 8 *thirds of an inch*, respectively. The three oblongs required on the right page are to be 1 inch high, and 19, 21, and 24 *thirds of an inch*, respectively.

Dictation. — *Left page:* Follow ¶ 1, in "Dictation," page 44. Draw verticals from 1 and 8 to the lower side of the imaginary oblong. On the upper horizontal, mark a point 3 thirds of an inch (how many inches?) to the right of the vertical from 1 and from that point draw a vertical to the next horizontal below, thus making an oblong 1″ high and 3 thirds of an inch long. One inch below this, make an oblong 1″ high and 5 thirds of an inch long. One inch below this, make an oblong 1″ high and 8 thirds of an inch long.

In making the oblongs at the right of the page, begin at the vertical drawn from 8. On the upper horizontal, mark a point 13 thirds of an inch (how many inches?) to the left of the vertical from 8, and from that point draw a vertical to the horizontal below, making an oblong 1″ high and 13 thirds of an inch long. One inch below, make an oblong 1″ high and 11 thirds of an inch long; one inch below this, an oblong 1″ high and 8 thirds of an inch long.

Right page: Follow ¶ 1, in "Dictation," page 44. Then set off 19 thirds of an inch (how many inches?) from the left end of the upper horizontal, and draw a vertical to the next horizontal below, thus drawing an oblong 1″ high and 19 thirds of an inch long. One inch below, make an oblong 1″ high and 21 thirds of an inch long; one inch below this, an oblong 1″ high and 24 thirds of an inch long.



The Laying Out and Arrangement of Oblongs on the Blank Pages.

Color. — If these are used as color as well as dimension exercises, the relative values of the Primary and Secondary pigment colors, yellow, red, blue, orange, green, purple, can first be recalled as given on page 45; that is, yellow 3, red 5, blue 8, purple 13, green 11, orange 8, and also their arrangement in half-inches.

It is now desired to have two pages in which the oblongs for the Primary, Secondary, and Tertiary colors shall be laid out in thirds of an inch. Tertiaries are made by mixing Secondaries. Oblongs for the two pages can now be drawn as shown on the opposite page. The left page is laid out for Primaries and Secondaries. This can be colored as directed on page 45.

The right page is laid out for Tertiaries. The upper oblong being opposite the purple should be colored with a mixture of the two other Secondaries, orange and green, making the Tertiary known as citrine, or orange-green. The second oblong being opposite the green should be colored with a mixture of the two other Secondaries, purple and orange, making the Tertiary color known as russet or orange-purple. The third oblong being opposite the orange, should be colored with a mixture of the two remaining Secondaries, green and purple, making the Tertiary known as olive or purple-green.

Below each oblong the name of the color should be written. Pupils having obtained through these exercises the color sensations of the Primaries, Secondaries, and Tertiaries, are ready to find and to recall objects having these various colors, thus fixing the color sensations and at the same time educating the color sense. If previously pupils could have practice in finding and matching colors according to the Color Chart of Dr. Jeffries, they would be much better prepared for this exercise.

Various exercises should also be given to fix the order of this page in the minds of the pupils, so that in using a Secondary and a Tertiary color together, they may always select those complementary to each other, —

ORANGE, Secondary, harmonizes with . . OLIVE or PURPLE-GREEN, Tertiary.
GREEN, Secondary, harmonizes with . . RUSSET or ORANGE-PURPLE, Tertiary.
PURPLE, Secondary, harmonizes with . . CITRINE or ORANGE-GREEN, Tertiary.

DECORATION;

OR, DRAWING AS APPLIED IN ORNAMENT.

Decoration is the science and art of producing beauty in ornament. The study of the facts of form of objects in Construction, and of their appearance in Representation, is now properly followed by the study of Decoration, or the means of enhancing the beauty of objects.

Ornament, the product of purely decorative art, is always employed to beautify objects created for some purpose, independent of their decoration. It produces its legitimate effect when, without concentration upon itself, it makes the object to which it is applied more pleasing than if unadorned.

Fitness to its purpose is the underlying principle, — the very corner stone of all good ornament. From this principle of fitness for its purpose there arises the fundamental law of ornament, — Subordination. This law requires, THAT ALL ORNAMENT SHALL BE MODEST AND MODERATE. Strong contrasts and striking effects violate it. Illustrations of this requirement in matters of good taste in general are familiar to all. A loud voice in conversation is not excusable; a forward, self-asserting manner is a mark of ill-breeding; gaudy colors in dress are shunned; showiness, or any other attempt to attract attention, is condemned. This requirement holds good in all ornament, whether architectural, domestic, or personal. He is not well dressed whose dress is conspicuous; that house is not well furnished where the furniture is obtrusive; that building is not well ornamented whose decoration is not subordinate to the idea of the building.

The Sources of Ornament. — The sources of ornament are Geometry and Nature; and it is difficult at times to distinguish between these two sources; for a thoughtful consideration of nature will show geometric plans and forms and modes of arrangement in nature's handiwork. Order, symmetry, and proportion are all exemplified in nature in varying degrees.

Materials of Ornament. — The materials of ornament are:

1. Geometric plans, enclosing figures and units.
2. Conventionalized units derived from natural forms as motives.
3. Historic ornament.

But, in order to use these materials effectively, it is necessary to study

(*a.*) Geometric construction and symmetric arrangement.
(*b.*) The proper use of plant forms as motives.
(*c.*) Well-selected examples of historic ornament.

Symmetric Arrangement. — The principal forms of arrangement (all requiring more or less of geometric construction) are :

1. A surface design, to cover a surface.
2. A border, to limit a surface.
3. A single arrangement, complete in itself.

Proper Use of Plant Forms. — "Flowers must be something more than flowers to the designer; he must seek out the plan of development, and then adhere closely to natural laws." Lead pupils as deeply as possible into the study of nature, in order that they may see for themselves the *spirit* of the plant which they are studying, as well as the more formal matter of arrangement. Then let them *conventionalize* plant forms for use in ornament, by keeping the characteristics of growth, curvature, and proportion while simplifying outlines and omitting details.

Historic Ornament. — In this course no attempt is made to teach styles of ornament. A few simple and characteristic examples have been selected from different styles, in order to lead pupils to consider beauty in ornament. The study of the characteristics of each style is left for more advanced work.

EXERCISE VIII. — Ornament. — Rosette.

From a Copy.

OBJECT. To study a rosette; to draw the rosette.

Study of the Copy by Pupils. — What kind of repetition do you see on this page? (*In Fig. 1, repetition around a centre; in Fig. 4, horizontal repetition.*) What is Fig. 4? (*A border.*) What does Fig. 1 look like? (*Something like a flower.*) It is called a ***rosette,*** from its resemblance to a rose.) What is the general shape of this rosette? (*That of a circle.*) How many units are there in it? (*Eight.*) What are the units like? (*Like triangles with the corners rounded.*)

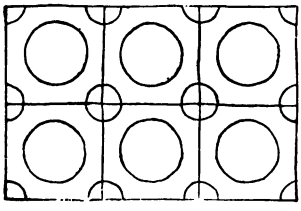
D. B., page L. — **Practice page for Ex. VIII. — Dictation.**

Practice. — Free movement, free drawing. Draw an oblong, using the angles given. Bisect the left side; from the point of bisection, draw a horizontal across the oblong. Trisect the upper side; from the points of trisection, draw verticals down the oblong. Complete according to the directions on p. 4, for D. B. I. page D, and the illustration below. This very simple design to cover a surface can be made the basis of arrangement for a more elaborate design for a surface covering. As, for instance, the rosette of page 7 could be drawn in each circle.

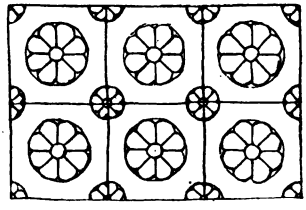
D. B., page 7. — **Drawing the Rosette.**

Observation Exercises for Pupils. — Can you think of any place where such an ornament would be suitable? Have you ever seen any rosettes as ornaments? Study Figs. 2 and 3 and give the steps for drawing the rosette.

Drawing. — Follow the steps brought out in the study of the stages. Erase unnecessary lines, and finish the rosette.



D. B., page L, completed.



Design for a Surface Covering.

EXERCISE IX. — Moorish Ornament.

From a Copy.

OBJECT. To study a historic ornament; to draw its outline.

Study of the Copy by Pupils. — The Moors were a people of dark complexion who lived in the northern part of Africa, and also in Spain. They were highly educated and produced a great deal of beautiful decoration. But as the Mohammedan religion forbade the imitation of animal or plant forms, their ornament was geometric in general character. The ornament given in this exercise was a favorite form in Mohammedan art and can be traced in various modifications all through Arabic and Moorish decoration. An example is given in the drawing-book of its use in an Arabic border.

***D. B., page 8.* — Drawing the Ornament.**

Drawing. — On the copy, sketch a vertical as an axis of symmetry; also horizontals to connect the ends of opposite curves.

Draw the figure in the space at the right, enlarging it to fill the space. First draw the axis of symmetry and two horizontals to correspond to those drawn on the copy. For each curve, practice first, movement on the copy, then over the space at the right, then draw with one sweep. Erase construction lines and errors, and complete the figure in broad, soft lines.

The illustrations below are historic variations of the copy. A purely original figure is not always necessary in ornament; in historic ornament, there will be found many modifications of a favorite figure.

What is history? (*The story of the past.*) When can we call an ornament ***historic?*** (*When the ornament is recognized as having belonged to the decorative art of some nation or people in the past.*)

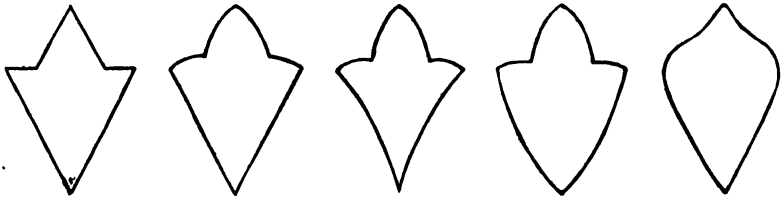
EXERCISE X. — Decorative Design. — Units Modified. — Arrangement about a Centre.

OBJECT. To study a unit and ways of modifying it, to modify units for arrangement about the centre of an oblong quatrefoil; to draw the arrangement.

Study of D. B., page 9, by Pupils. — Look at the large printed outlines, Figs. 5 and 6; what is the general shape? (*Oblong.*) What is there on each side of the oblong? (*A semicircle.*) Do you remember any figure made of four semicircles? (*A quatrefoil.*) (The teacher gives the name ***oblong quatrefoil.***)

In Fig. 1, you see a design in an oblong quatrefoil; how many units are there in the design? (*Four.*) How do they compare with each other? (*Two are larger and two smaller; they look alike in outline, but they are not of the same proportion.*)

How did you modify a unit in Book II.? (*In outline; by drawing curved lines instead of straight.*) How else can a unit be modified? (*In its proportion.*)



D. B., page **M. — Practice page for Ex. X.**

Practice. — Fig. 1 is a unit of design. Construction lines like those of Fig. 1 are given for Fig. 2. On these construction lines, a symmetric unit differing in outline from Fig. 1 is required. Modify the outline by substituting curved lines, wholly or in part for the straight lines of Fig. 1. In Fig. 1, the upper part is divided into three parts, and the points of division fall on the construction line. In the modification, the points of division may or may not be on the horizontal construction line. The curves should not be deep.

Construction lines for a unit differing in proportion are given at Fig. 3. On these lines draw a unit similar to the one drawn at Fig. 2.

Practice movement for the curves before drawing. *No erasing.*

D. B., page **N.** — **Second practice page for Ex. X.**

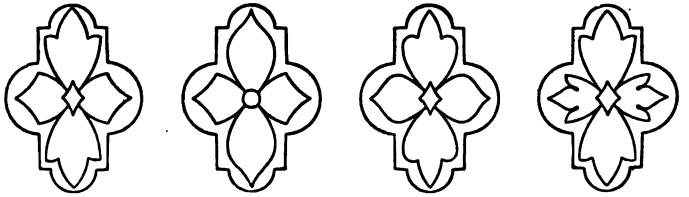
Observation Exercise for Pupils. — What is the proportion of height to width in Fig. 1, page **M**? (*3 to 2.*) If you had the height given, how could you get the width? (*Trisect the height and make the width equal to two-thirds of this height.*)

Practice. — At Fig. 1, points are given for the axis of symmetry of a unit like Fig. 1, page **M.** Draw the axis, trisect it, and through the upper point of trisection draw a horizontal equal to two-thirds the vertical. On these construction lines draw a new modification of Fig. 1, page **M.**

At Fig. 2, points are given for the construction lines of a unit differing in proportion from the one just drawn. Draw these lines and on them draw a unit similar in outline. *No erasing.*

D. B., page 9. — **Arranging Units to make a Design and Drawing the Design.**

Observation Exercises for Pupils. — A design is required for an oblong quatrefoil, Fig. 5; how much space should there be between the units and the outline, or ***enclosing figure?*** (*About a quarter of an inch for this figure.*) Fig. 2 is a leaf; *this* may suggest to you a modification of a unit.



Arrangement. — Decide on a unit. Cut from colored paper two units to be placed on the vertical diameter of the quatrefoil, and two of proper proportions for the horizontal diameter. Draw the diameters of the quatrefoil, Fig. 5; arrange the units to meet at the centre, and paste them at the centre. Cut a central figure like Fig. 3 or Fig. 4 and paste on the design.

Drawing. — Draw the diameters of Fig. 6. On these diameters draw the design arranged in Fig. 5. Draw the units by opposites. Erase diameters and lines within the central figure. Finish the design with broad, soft lines.

EXERCISE XI. — Toy House. — Three Views.

MODEL: *Toy House made by the pupil.*

OBJECT. To make a model of a house, to study its end, side, and top views, and to draw them.

D. B., page O. — The Pattern for the Model.

Study of the Pattern. — What is Fig. 1? Fig. 2? How many parts has Fig. 1? Which parts are alike? Can you tell what parts of the house they are? What is the shape of the side of the house? the proportion of height to width? What is the shape of the end? (*A square with a* ***right-angled triangle*** *on the upper side.*) What is the proportion of height to width?

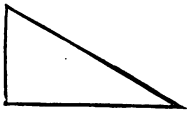


Fig. 1.

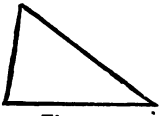


Fig. 2.

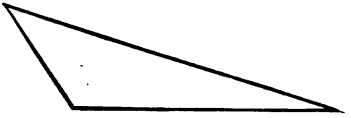


Fig. 3.

Illustrations are given (for the teacher's use) of triangles named from their angles.

Fig. 1, a right-angled triangle, having but one right angle; Fig. 2, an acute-angled triangle, having all its angles acute; Fig. 3, an obtuse-angled triangle, having one obtuse angle.

Making the Model. — Detach the page. Cut out Fig. 1, fold firmly along the light lines and paste it. Cut out Fig. 2 and paste it on as a roof.

D. B., page 10. — Drawing three Views.

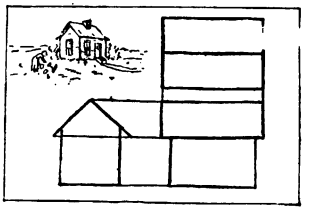
Study of the Model by Pupils. — Hold the model at arm's length, on a level with the eyes, end toward you. How does the *end view* differ from the *end* of the house as printed in the pattern? (*The roof is seen overhanging the sides.*) Can you draw the end view on the board?

Hold the model with the side toward you. How wide is the side of the house? (*The width of the side is equal to the whole height of*

the house.) How high is the *side view?* (*As high as the end view.*) What part of the house does the roof hide in the side view? Can you draw the side view on the board, carrying the various heights across from the end view?

Look down on the model. How wide is the top view from left to right? (*As wide as the roof in the side view.*) From front to back? (*As wide as the roof in the end view.*) Can you draw the top view on the board?

Drawing. — A printed line is given for the base of the end view, and an angle for the lower left corner of the side view. On the printed line, as a base, draw a square lightly. Draw a light vertical diameter, extending it indefinitely upward. On this line fix the height of the end view, and draw the roof, remembering to make it overhang.



D. B., page 10, completed.

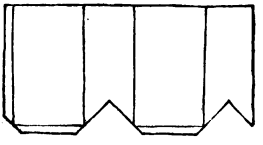
Draw the side view, carrying indefinite horizontals from the end view. Make the length of the side of the house equal to the height of the house and add a sufficient length for the roof.

Draw the top view, making it as long as the roof in the side view and as wide as the roof in the end view.

Making. — Make at home such a house, but change the dimensions, making the ends 3 inches wide and the sides 4 inches wide.

Draw first the three views of the house, the end view, the side view, and the top view; then draw the pattern. The house can be made of pasteboard or of wood. A door, windows, and chimney might be added, so that the house when made would be a model of the little house illustrated on the page of the drawing-book.

The pattern of the chimney furnishes quite a problem; most pupils, however, will work it out for themselves. The pattern is given below.



EXERCISE XII. — Group.

From Objects.

OBJECT. To arrange a pleasing group containing a cylindric form; to study the appearance of the group, to draw the appearance.

Study by Pupils of the Arrangement of a Group. — In studying the arrangement of a group, consider, —

1. The place of the principal object.
2. The place of the secondary objects.
3. The figure made by the group on the table.
4. ***Unity*** of the group — distance between objects.
5. ***Repose*** of the objects.
6. ***Variety*** in the positions of the axes and in the faces visible.
7. Partial view of some of the objects.
8. Upper line of the group.

(The teacher will recall these topics to the pupils by arranging a group where all can see, and calling not only for opinions as to the arrangement whether it is pleasing or not, but also for changes that should be made and the reasons for them. The topics are stated more in detail on page 68.)

(The teacher can also vary this exercise to advantage by asking pupils to bring in pictures of groups of objects, of animals, or of people, see page 69, to be studied with reference to these points by the class.)

Arrangement of a Group by Pupils. — Arrange a group of two, or at the most three, very simple forms, comprising a cylindric object and fruit or vegetables. As you arrange the group, study it with reference to each of the points mentioned. The aim should be to make the group as pleasing as possible in general effect.

***D. B., page* R. — Practice page for Ex. XII.**

Practice. — Having arranged a group, obtain the proportion of the width to the height of the group, by measurement on the pencil, as illustrated on the second page of the cover of Drawing Book III. Indicate by light verticals and horizontals the space to be occupied by the group, making it of a suitable size for the page and of the proper proportion. Block in first the principal object in the group and then the others. Draw the table line, studying to place it well. Draw the curves over the blocking-in lines. *Do not erase or finish.*

***D. B., page 11.* — Drawing the outlines of a Group.**

Observation by Pupils. — Describe the illustrations in the drawing-book, with reference to the points mentioned. Improve the arrangement of your own group if you can.

The group of models given above may suggest an arrangement of objects similar in form.

Drawing. — Follow the directions given for practice. Correct, erase wrong lines, and finish.

EXERCISE XIII. — Decoration. — Rosette. — Top View of a Flower.

MODEL: *Five-petalled Flower.*

OBJECT. To study arrangement in the top view of a flower; to draw a rosette from the top view.

Study of Buttercups by the Pupils (each having one if possible). What is the color of your flower? Look at the inside and at the outside of the flower; what do you notice? (*There is a circle of yellow leaves and outside of them there is a circle of green leaves.*) The inner circle of flower leaves is called a ***corolla,*** or a little crown; the outer circle is called a ***calyx,*** or cup.

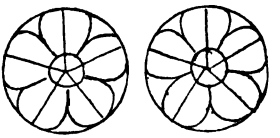
How many leaves has the corolla of the buttercup? (*Five.*) The leaves of a corolla are called ***petals.*** What is the general shape of the centre? The centre is filled with threadlike parts, stamens and pistil, too small to be studied now. How many petals has the buttercup? Do you know any other five-petalled flowers?

Open your drawing-books at page 12. What is Fig. 1? Fig. 3? How could you use such a rosette or such a border in decoration?

D. B., page Q. — Practice page for Ex. XIII.

Study of Fig. 1. — What is Fig. 1? (*A circle.*) How is it divided? (*It is divided into five equal parts by lines starting from the centre.*) (The teacher gives the terms, ***radius,*** plural ***radii,*** and ***circumference.***)

Practice. — Fig. 1. Draw in this circle a rosette from the buttercup; first draw the petals lightly, using each radius as an axis for a petal. Add a central circle of proper proportion to the rosette.



D. B., page Q, completed.

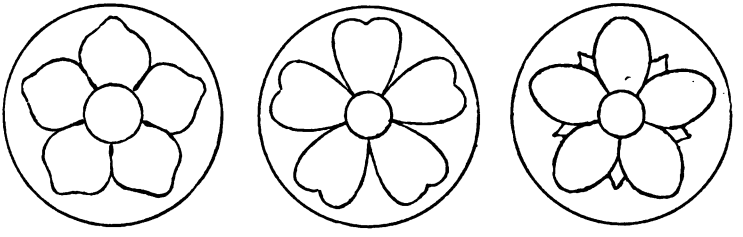
Fig. 2. Divide the circumference into five equal parts and draw five radii. Repeat in this circle the rosette just drawn.

D. B., page 12. — **Drawing a Rosette.**

Studying the Model. — (Each pupil should have a five-petalled flower, not a buttercup, if possible.) What is the shape of the petals of your flower, as seen in the top view? What is the name of your flower?

Study carefully the beauty of the flower, in the whole ***arrangement*** and ***proportion,*** in the ***shape*** of the petals, in the ***grace of the curves.*** These are the elements which will make the beauty of the decorative figure.

Can you think of an object which you can make and decorate with a rosette, used either simply, or repeated for a border, or for a surface covering?



(The teacher should encourage the pupils to use the rosettes drawn, in decorating some object, by drawing, by cutting, by embroidery, by carving, or by painting.)

Drawing. — A circle is printed. Within the circle draw a rosette from your flower, making the rosette a little smaller than the circle, following the order given for the practice page. To limit the size of the rosette, make a point on each radius about $\frac{1}{8}''$ from the circumference. Finish the rosette in broad, gray lines, *or* color the rosette, using one tertiary and one primary color.

LANGUAGE.

Teachers should continue to give pupils practice in the use of the terms and names on pages 28 and 54, as well as in the use of those given below, always requiring complete sentences.

Names of Models, Objects, and Details.

ELLIPSOID, OVOID, EQUI. TRI. PRISM.

ELLIPSE, OVAL; long diameter, short diameter.

TRIANGLE; equilateral, right-angled; vertex, altitude, base.

CIRCLE; radius, radii, circumference.

LINES; tangential union.

FLOWER; corolla, calyx, petals.

COLOR; olive or purple-green; russet or orange-purple; citrine or orange-green.

Terms of Construction.

FACTS; top view, front view, left side view, right side view, end view.

Terms of Representation.

APPEARANCE; the level of the eye, below the level of the eye.

ARRANGEMENT OF A GROUP; Unity, Variety, Repose.

Terms of Decoration.

ORNAMENT; geometric, historic.

REPETITION; horizontal, around a centre: border, rosette, surface covering.

DETAILS; enclosing figure, central figure; oblong quatrefoil.

UNITS; their modification in outline, and in proportion.

BEAUTY; arrangement, proportion, shape, grace of curves.

BOOK IV.

CONSTRUCTION. *Facts of Form.*	SOLIDS: Cube, Cylinder, Cone, Square Prism. OBJECTS: Books, Boxes, Slate. MAKING: Cones, Lamp Shade. CONSTRUCTIVE DESIGN: Vase Forms.
REPRESENTATION. *Appearance of Form.*	CONE, TUMBLER, FLOWER POT. BOOK CLOSED, BOOK OPEN. NATURAL BRANCH. COMPOSITION: Group of Models.
DECORATION. *Ornamentation of Form.*	SPIRAL BORDER; GOTHIC LEAF. DECORATIVE DESIGN: Natural Growth, Conventionalization, Rosette. NATURAL GROWTH: Branch.

DRILL EXERCISES.

Drawing-Book, *page* A.

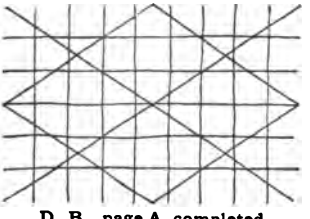
OBJECT. Practice for proper position, pencil-holding, and free arm movement, horizontal, vertical, oblique.

Directions to the Teacher. — Before beginning work in the book, be sure that pupils know how to hold their pencils for free movement and drawing. Give practice in movement with the pencil from left to right, and see that *each pupil* holds the pencil properly (see Fig. 1, p. xiii), — the same for movement from top to bottom (see Fig. 2, p. xiii), — and from corner to corner (see Figs. 3 and 4, p. xiii).

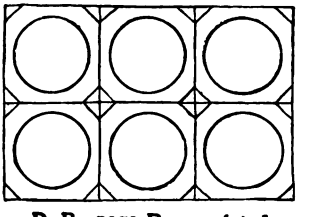
Practice. — Draw horizontals from *a*, *b*, *c*, *d*, *e*, ending these lines directly below 9. Draw verticals from 1, 2, 3, 4, 5, 6, 7, 8, ending these lines directly opposite *f*. Bisect the space between the verticals from 4 and 5, at top and bottom, — mark the points of bisection, *g* and *h*. Find the horizontal from *c*, and mark its right end *i*. Place a point for a lower right-hand corner opposite *f*, and mark it *j*.

Draw *c g*, *f 9*, and *h i*, — draw *c h*, o *j*, *g i*.

Practice arm movement for each line before drawing. *No erasing.*



D. B., page A, completed.



D. B., page B, completed.

Drawing-Book, *page* B.

OBJECT. Practice in laying out a page, — proper position, pencil-holding, free arm movement, horizontal, vertical, circular, oblique, — giving a suggestion of surface covering.

Study of the Oblong. — Turn to D. B., page 1, and study the oblong made by the marginal lines. What are the dimensions of this oblong? How wide is the margin of the page at the top and bottom? at the left and right?

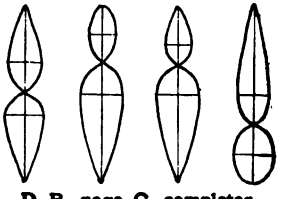
Practice. — Free movement, free drawing. Draw an oblong, 6″ high by 9″ wide, using the angle given as the upper left hand corner. Bisect the left side; from the point of bisection draw a horizontal across the oblong. Trisect the upper side; from the points of trisection draw verticals down the oblong, making 6 squares. In each square draw a circle about 2″ in diameter. Finish as in the illustration of the page completed, by drawing at each intersection of the dividing lines a square on its corner, having a diagonal of 1″ (the point of intersection being the centre of the square), a half square at each end of each dividing line, and a quarter square at each corner of the oblong.

Drawing-Book, *page* C.

OBJECT. Practice in drawing reversed curves continuously with free arm movement.

Study of Curves by Pupils. — Books opened at page C. What kind of curves do you see on this page? (*Reversed curves.*) Look at the reversed curve, Fig. 1, and see whether the two curves of which it is composed are circular, or elliptic, or ovoid. Describe these two curves. (*They are ovoid, — but although similar in general character, they are not exactly alike, — the lower curve has the greater altitude.*) How is the central line divided? Compare the place of the altitude of the two curves. Study Figs. 2, 3, and 4 in the same way.

Practice. — Fig. 1. Practice continuous movement over the printed curve until its character is felt, — then practice a corresponding continuous movement for a balancing curve on the same central line. Draw the balancing curve with one sweep of the pencil. Repeat for Figs. 2, 3, and 4. *No erasing.*



D. B., page C, completed.

CONSTRUCTION.

EXERCISE I. — Cube, Cylinder, and Cone. — Two Views.

MODELS: *Cube, Cylinder, Cone, Triangular Tablets.*

OBJECT. To recall the form of a cube and of a cylinder, to study the form of a cone, to study and to draw the facts of the three solids.

Study of the Model by Pupils. — Here is a group of three models; name the two which you know. Compare the other model with the cylinder; tell how they are alike, — how they differ. (The teacher gives the name ***cone.***) What is the proportion between the altitude and base of the cylinder and of the cone? How should an object be held in order to obtain a front view? (*It should be held so that only its height and its width from left to right are visible.*) How should it be held in order to obtain a top view? (*It should be held so that only its width from left to right and from front to back are visible.*) What would you draw for the top view of a cube? of a cylinder? of a cone?

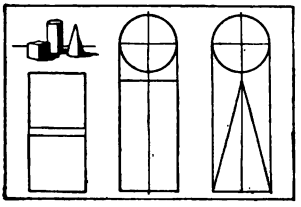
Making the Model. — Turn to page S, cut out the pattern, roll and paste to make a hollow cone.

On the cone trace the outline of the front view, beginning at the vertex, moving down the left side, straight across the bottom and up the right side. Trace this outline in the air. Find the tablet having the shape of this outline. How do the two sides of the tablet compare in length? (*They are equal.*) (The teacher gives the name ***isosceles*** *triangle, having two sides equal.*) See Fig. 2, p. 62.

What would you draw for the front view of a cube? of a cylinder? of a cone? Draw the front and top views of a cylinder and of a cone upon the board. How should they be placed? (*The top view should be directly above the front view.*) The easiest way to place two views on a line with each other, either vertically or horizontally, is to draw first a light ***centre line*** for both views. This line generally extends a little above and below the views to show that it does not represent any part of the object. The lines by which dimensions are carried from one view to another are called ***working lines.***

***D. B., page* D. — Practice page for Ex. I.**

Practice. — ***Cube.*** The front view of a cube is printed, — draw the top view, about ½″ above the front view. Move upward from the left vertical, and fix a point for the upper left corner of the top view. Fix a point in a similar manner for the right corner. Draw the left and right verticals, the upper and lower horizontals.



D. B., page D, completed.

Cylinder. The base line of the front view is given. Bisect it and draw a light, indefinite centre line. Draw the front and top views, obtaining the place of the top view and its width by movement up from the front view.

Cone. The base line of the front view is given. Bisect it and draw a light, indefinite centre line. Draw the front and top views, placing the top view of the cone on a line with the top view of the cylinder, and obtaining the place of the top view and its width by movement up, from the front view of the cone and across, from the top view of the cylinder.

***D. B., page 1.* — Drawing the facts of the Cube, Cylinder, and Cone.**

Observation Exercises by Pupils. — What did you draw on page D? Such drawings show the ***facts*** of the cube, — they are the basis of working-drawings from which objects are manufactured. If the dimensions required were marked upon these drawings, they would be working-drawings. In the illustration in the drawing-book the ***appearance*** of these solids is given, that is, they are represented as they appear to the eye in certain positions. Hold the cube so that you have the top view, the front view. Hold it so that it appears to you as represented in the illustration on page 1. Repeat with the cylinder and the cone. Can you mention objects like the cone?

Drawing. — Follow the directions given for Practice. Finish the different views in soft, gray lines.

Making. — On D. B., page S, three small patterns for cones of different proportions are printed. With these as guides, patterns may be cut for larger cones, which can be rolled and pasted. If the top of one of these paper cones could be cut off parallel to the base, the part remaining would serve for a lamp or candle shade; and if that part could be unrolled, it would show the pattern of a lamp shade. Such a pattern is printed on page R as a model; the pattern itself cannot be cut out, until after page Q has been used as a practice page for Exercise XII.

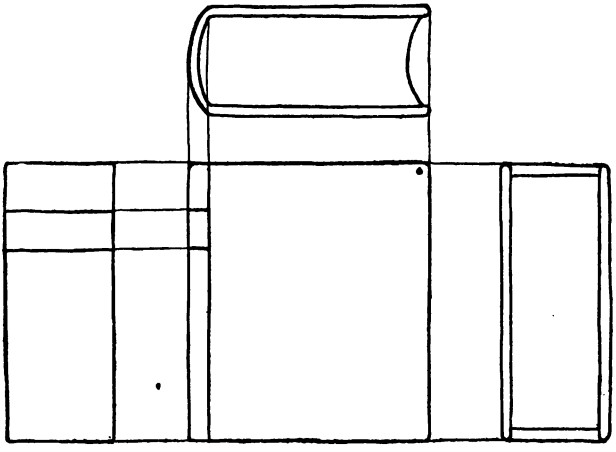
EXERCISE II. — Three Views of a Book.

From a Book.

OBJECT. To study a book as to the facts of its form, to draw the facts of its form in three views.

Study of a Book by Pupils. — Take the thickest book that you have. How many ***dimensions*** has it? in how many ways should you measure it if you wished to give the size?

Hold it upright so that you get a back view, — a side view, — a top view. Remember that these terms refer to the facts of objects, and that in each case the book must be held so that but two dimensions are visible. Views giving the facts of form — ***geometric views*** — show but two dimensions. What is the general shape of the back view? the side view? the top view? What is the proportion of the width to the height in the back view? in the side view? Compare the thickness in the back, front, and top views.



Four Views of a Book.

What is there to be seen within the outline of the back view? (***The title-piece.***) Describe its place on the back.

In the side view, what do you see beside the flat side cover? (*That the cover curves out in the back, and thus adds width to the side view; also half the title-piece* **foreshortened.**) In the top view, what do you see? (*The curving out of the cover at the back, the corresponding curving in of the leaves in front, and the thickness of the cover.*)

There is no definite rule for the distance in a drawing between any two geometric views of an object; it is generally proportioned somewhat to the size of the views, and to the space to be filled. The views should not, however, be so near together as not to be readily distinguished from each other, nor so far apart as to appear as if they did not belong to each other.

***D. B., page* E. — Practice page for Ex. II.**

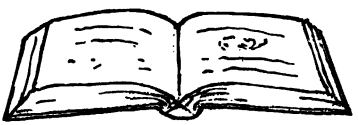
Practice. — Determine the proportion of width to height in the side view, and draw it, using the angles given for the left vertical. At the left of the side view, draw the back view, determining the proportion of width to height, and obtaining the height by movement and by drawing light *working lines* from the side view. Above the side view, draw the top view, by the aid of working lines, obtaining the two dimensions from the side and back views.

***D. B., page 2.* — Drawing three views of a Book.**

Observation Exercises by Pupils. — What do Figs. 1 and 2 show? (*The facts as seen in two views.*) How many dimensions do the two views taken together show? What does Fig. 3 show? (*The appearance of the book when lying turned and somewhat below the eye.*)

Hold your book so that it will appear like Fig. 3. Your book may not be of the same proportion as that in Fig. 3, but you can hold it turned and somewhat below the eye, so that the general appearance will be the same.

Drawing. — Draw three views of the book, showing the *facts* of its form. Follow the order given for practice on page **E.** Finish the three views in soft, gray lines.

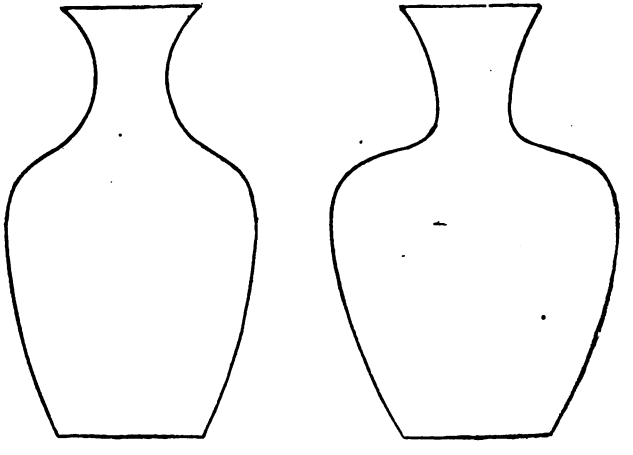


EXERCISE III. — Constructive Design. — Vase Form.

MODELS: *Vases of simple outline, differing in proportion and profile.*

OBJECT. To study the proportion and profile curves of vases, — to design a vase of pleasing form and proportion.

Study of the Form of a Vase by Pupils. — What is the purpose of a vase? What is the proportion of the height to the width of this vase? Is the vase of pleasing ***proportion?*** Would it look better if it were higher? if it were wider? Compare it with the other vases as to proportion. Look at the ***profile curves*** of the vase. What is the general character? Suppose a vertical passing through one of the profile curves, how would it be divided by the curve? Study the profile curves of the other vases. Which are the most pleasing?



Open your books at page 3. How are the verticals of Figs. 1, 2, 3, 4 divided by the curves? (*The verticals are bisected by the curves.*) The verticals of Figs. 5 and 6? (*The curves cross the verticals one-third from the top.*) The verticals of 7 and 8?

(The front views of two vase forms are given, as suggestions to teachers for work upon the board.)

D. B., page F. — Practice page for Ex. III.

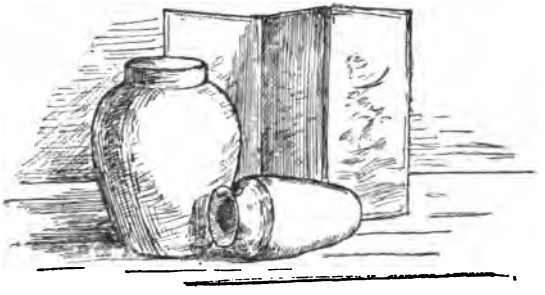
Practice. — Connect the points given by light verticals. Trisect the verticals. Through the ends of each vertical draw a light horizontal, one-third the length of the vertical, extending equally to the left and right of the vertical. Connect the ends by light verticals. You have now construction lines for drawings for two vase forms. Select a profile curve from page 3, which is pleasing to you for each vase form. Study the two curves selected. Divide the outer verticals of each figure as the curves require. Practice movement for the left curve of the vase form at the left, and draw with one continuous sweep, — the same for the balancing curve. Draw the right vase form in a similar way.

D. B., page 3. — Drawing the Vase Form.

Observation Exercises for Pupils. — Study carefully the two drawings for vase forms that you made on page **F.** Are they pleasing in general appearance? Could you improve upon them?

Cutting vase forms is a pleasant exercise in designing. Having drawn the construction lines and divided the outer verticals, fold the paper along the central line, keeping the construction lines visible, and cut a curve which seems pleasing. Unfold the paper, note the effect and try again. This method is that of some eminent designers of vase forms.

Drawing. — In the middle of the space, draw a light vertical. Upon this as a central line make a drawing for a vase form, either one of those drawn on page **F** or another, but keep the same proportion. Follow the order given for the practice page. Correct, erase wrong lines, and finish with broad, soft gray lines.



REPRESENTATION.

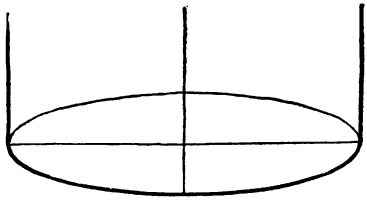
EXERCISE IV. — Tumbler. — Flower-pot. — Facts and Appearance.

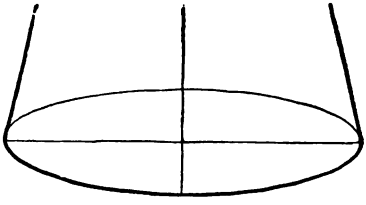
MODELS: *Cylinder, Cone, Flower-pot.*

OBJECT. To study the appearance of conical objects, to draw their appearance.

Study of the Models by Pupils. — Hold the cone so that the vertex is on a level with the eye, — lower it four inches; what is the appearance of the edge of the base? (*It appears to curve downward.*) Does it appear like a circular curve? (*It appears like an elliptic curve.*)

Hold a cylinder in the same position; compare the curves of the bases of the models. Can you see any more of the curve in one model than in the other? How do the profile lines join the curve in the cylinder? in the cone? (*Tangentially in both; but in the cylinder the profile lines seem to meet the curve at the ends of its long diameter, — in the cone, they seem to meet the curve beyond the ends of its long diameter.*)





Study of the Cone Inverted. — If the top of the cone is cut off, parallel to the base, the part remaining is called a ***frustum.*** Many common objects are like the inverted frustum of a cone. Can you mention any?

Study the appearance of a large object based on an inverted cone, like a waste-basket or a flower-pot. How do the curves at the top and bottom compare? (*The curve at the bottom appears deeper in proportion to its long diameter than that at the top.*) If the curve at the bottom is not readily seen, place the basket on a dictionary and the flower-pot

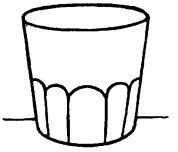
upon a smaller book. The straight edges of the books will contrast sharply with the curves at the bottom of the objects.

D. B., page G. — Practice page for Ex. IV.

Practice. — On the left half of the page, draw the appearance of an upright cone somewhat below the level of the eye. Determine the proportion of width to height by measurement on the pencil (see second page of Drawing-Book cover). Draw a central vertical. Determine the place for the diameter of the ellipse at the base and draw it. Draw a complete ellipse for the base. Draw the profile lines of the cone *tangent to* (see page 71), not cutting, the ellipse. On the right half, draw the appearance of an object based on an inverted cone. Begin by drawing a central vertical. *No erasing.*

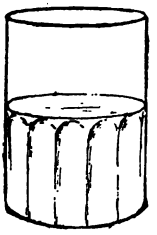
D. B., page 4. — Drawing the appearance of a Flower-pot.

Observation Exercises by Pupils. — Place a flower-pot below the level of the eye. Study the appearance of its thickness at the top. Where does the thickness appear the greatest? (*At the left and right.*) Where the least? (*At the back.*)



Figs. 1 and 2 show the facts and the appearance of a tumbler. What does Fig. 3 show?

Drawing. — Draw in the space at the right the appearance of a flower-pot, making a large drawing of a suitable size for the space. Follow the order given for practice page **G.** Correct errors, erase, and finish with broad, soft gray lines.



EXERCISE V. — Rectangular Object in front of, and below the Level of, the Eye. — Its Appearance.

OBJECT. To study the appearance of a rectangular object in front of, and below the level of, the eye; to draw the appearance.

Study of the Object by Pupils. — Select the thickest book you have. Lay it well back on the desk, the back of the book toward you. Place a pencil vertically at each end of the back. Close one eye and incline the pencils toward each other until they appear to cover the left and right edges of the book. What is the apparent direction of the left and right edges? (*Toward each other.*) Which *appears* longer, the nearer or the farther edge? (*The nearer edge.*)

Slip a piece of string three or four feet long under the upper cover of the book, as far as the binding. Sit opposite the middle of the book, and holding the strings with one hand, move them until they hide the left and right edges of the book-cover. In doing this, incline the strings toward each other as the case may require, but do *not* incline them backward or forward. See Fig. 1, p. 101. Do they meet above, below, or on the level of your eye? If you hold the strings so that the left and right edges of the book are covered, the strings will meet exactly on a level with your eye.*

Hold the strings with the left hand; and compare by measurement on the pencil, the length of the book, and the distance between the book and the point where the strings meet.

* This exercise serves to bring out not only that the left and right edges appear to converge, but also that they appear to converge toward a point on a level with the eye, — two extremely important points. The exercise was presented by Mr. Perry at his Saratoga summer classes in 1885, 1886, and 1887 to the great satisfaction of the teachers who were members of the class and who have since used it in their own teaching. It has been carried out very pleasantly by the use of a rubber band in place of the string.

Changing the strings to the right hand, place a ruler against them so that the lower edge of the ruler just hides the farther edge of the cover. Look now at the shape of the cover as inclosed between the strings and the ruler; describe it. (*A four-sided figure having the front and back parallel, but the left and right sides* **converging**.) Compare the two parallel sides as to length. Compare the distance between them with the length of the nearer side.

Fig. 1.

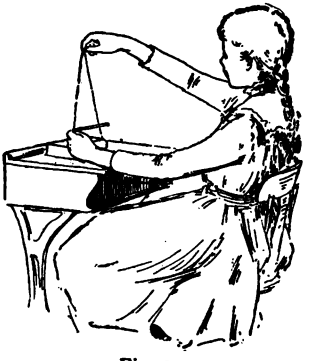


Fig. 2.

Put away the string and ruler; measure on your pencil held vertically the distance between the nearer and the farther edge and compare it with the length of the nearer edge. Look now at the ends of the book and at the bands of the title-piece; do they appear to curve; if so, which way do they seem to curve?

D. B., page H. — Practice page for Ex. V.

Practice. — Make a large drawing of the book as you see it, drawing first the back; then draw a horizontal for the level of the eye, *placing it as far above the drawing in proportion to its size as the eye is above the object itself;* on this line, place a point directly above the middle of the drawing of the back; draw the top of the book, making the left and right sides converge toward the point just made.

D. B., page 5. — Drawing the appearance of a Book.

Drawing. — Draw the appearance of a book, slate, or rectangular box, following the order given for practice on page **H.** Finish in soft, gray lines.

EXERCISE VI. — Book Opened. — Appearance in front of, and below the Level of, the Eye.

From an open Book.

OBJECT. To study the appearance of an open book in front of, and below the level of, the eye; to draw the appearance.

Study of the Object by Pupils. — Open the book which you used in the last exercise, as in Fig. 1, Fig. 2, or Fig. 3, D. B., page 6, and place it back on the desk, in front of you. What is the general shape of the book as it lies open? (*An oblong, lying from left to right.*) What is its thickness now, compared with its thickness when closed?

Slip a string under the front ends of the book and study the direction of the ***receding*** edges (*edges running from front to back*), as in the last exercise. How many *receding* horizontal edges are there? Hold the ends of the string so as to hide the left and right edges of the cover. Having adjusted these, hold them with the left hand; with the right hold a ruler vertical, with the edge toward you, so that it will hide the middle of the book from you. Where does the ruler meet the strings? If it does not reach them, where would it meet, if it were prolonged? (*On the level of the eye.*)

Imagine the left and right edges of the leaves continued; what is their *apparent* direction? (*Toward the point where the ruler and strings meet.*) What is the actual relative direction of the edges? (*Parallel.*) What general conclusion do you make from the study of the appearance of these edges? (*That all parallel horizontal edges, receding directly from the eye, appear to converge to a point on the level of the eye.*) Still holding the strings, place the ruler across, as in Ex. V., so as just to hide the farther edges; what is the general shape of the appearance?

***D. B., page* 1. — Practice page for Ex. VI.**

Study by Pupils to place the Drawing well. — What is the proportion of the whole height of the *appearance* of the book to its width? How wide a drawing can you make on the page, to look well? How wide a margin should you have at the left and right?

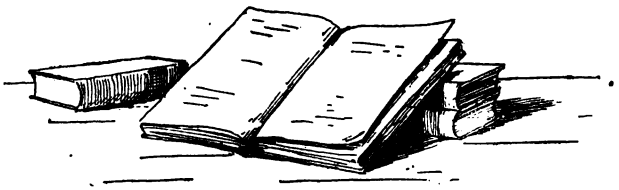
(*Not less than an inch on a page of this size.*) At the bottom? (*Not less than three-quarters of an inch.*) If you make your drawing seven inches wide, about how high should the whole drawing be? Determine, then, how much space you will leave above and how much below the drawing, making the space below less than that above.

Practice. — Draw a light horizontal for the lower line of the drawing, of a suitable length for the page, and as far above the lower edge as determined in the study to place the drawing. Draw a horizontal for the level of the eye; if necessary, slip a piece of paper under the upper edge of the page upon which to draw this line called (L. of E.). Place a point on L. of E. directly above the centre of the lower horizontal. Draw all horizontal receding edges toward this point. Complete.

D. B., page 6. — **Drawing the appearance of an open Book.**

Observation Exercises by Pupils. — Look out of the window. Which do you see more distinctly, the objects near to you or the objects far away? Can you think how a distant hill and trees look? What can you say about the relative clearness of outline of near and distant objects? (*The outlines of near objects are distinct, but those of distant objects are somewhat vague and indistinct.*) In drawing, the effect of distance is increased by making those parts farther from the eye, less distinct than the parts nearer the eye.

Drawing. — Draw according to the directions for the practice page. Finish in broad, soft gray lines, varying in thickness, making the lines on the farther edges less distinct than those on the nearer edges, and making the receding edges a little fainter as they go farther from the eye.



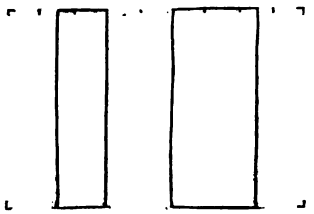
OPTIONAL EXERCISES IN DIMENSION AND IN COLOR.

The two blank pages facing each other in the middle of the book are to be used for these exercises. They may be exercises in Dimension only, or in Dimension and Color combined.

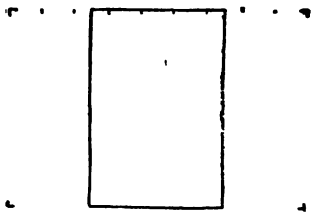
Dimension. — These exercises afford practice in drawing vertical oblongs of different dimensions.

The two oblongs required on the left page are to be 6 inches high, and 3 and 5 *half-inches* wide respectively.

The oblong required on the right page is to be 6 inches high, and 8 *half-inches* wide.



Left page, completed.



Right page, completed.

Dictation. — *Left page:* Lay out an imaginary oblong, 6″ by 9″; see "Dictation, page 44. Divide the imaginary upper horizontal into inches by trisection. Number the inches 1, 2, 3, 4, etc. Bisect the second inch. Using the point of bisection just made, as the upper left corner, draw a vertical oblong, 3 half-inches wide and 6 inches high. Using the point 5, as the upper left corner, draw another vertical oblong 5 half-inches wide and 6 inches high.

Right page: Lay out the oblong as for the left page, dividing the imaginary upper horizontal into inches and numbering them 1, 2, 3, 4, etc. Bisect the third inch. Using the point of bisection as the upper left corner, draw an oblong 8 half-inches wide and 6 inches high.

Color. — If these are to be Color as well as Dimension Exercises, the relative values of the Primary pigment colors should be recalled; yellow 3, red 5, blue 8. The purpose is, not so much to keep before the pupils the numerical ratio of the color values as to fix in their minds that, in order to produce a harmonious and satisfactory result in the use of these three colors in composition (unless working to a particular scale of color), there should be less yellow than red, and less red than blue. To continue this impression, the relative values of the colors are adhered to in this exercise.

Questions may be given to recall the Secondaries and the Tertiaries; and also the harmony of Secondaries and Tertiaries, see page 75.

In the Color Exercises in previous books, the Primary, Secondary, and Tertiary colors have been learned in laying on ***flat washes.*** In the exercises for this book, ***graded washes*** are introduced. In making a graded wash, work should be begun at the top with a brush full of wet color; more water should then be taken in the brush, to float the color down in gradually decreasing strength, and this should be repeated, thus making a wash graded from full down to pale color. The surface on which the work is done should slant a little. Oblongs for the two pages can be drawn as dictated above. The first oblong can be colored with a graded wash of yellow; the second, with a graded wash of red; the third, with a graded wash of blue.

DECORATION.

DRILL EXERCISES.

Drawing-Book, *page* J. — Equable Spiral.

Study of the Copy by Pupils. — Describe the direction of the line in this figure. The figure is called a ***spiral.*** As the line goes round and round, how do the distances between the parts compare at different points? (*They are equal.*) Therefore, the spiral is called an ***equable spiral.*** One revolution of the line is called a ***spire.*** Can you mention any object that resembles this figure?

Practice. — Draw a vertical and a horizontal through the points given on the right half of the page. Beginning at the centre of the copy, move over the printed spiral. Repeat through the points given, then draw with continuous motion.

Drawing-Book, *page* K. — Variable Spiral.

Study of the Copy by Pupils. — Compare this spiral with that on page **J.** How do they differ? What can you say of the distance between the spires at different points? (*It is constantly increasing.*) Therefore, this figure is called a ***variable spiral.***

Practice. — Follow the directions for drawing the equable spiral.

EXERCISE VII. — Border of Reversed and Spiral Curves.

OBJECT. To study and to draw a border of reversed and spiral curves.

Study of the Copy by Pupils. — With pencil in hand, move over the long curve which passes through the border; what kind of a curve is it? (*A reversed curve.*) A reversed curve repeated forms what is called a ***wave line.*** What other curves are there in the border? (*Spiral curves.*) Begin movement again over the reversed curve, but

pass around over the first spiral; repeat. How does the curve of the spiral unite with the reversed curve? (*Tangentially.*) Describe the movement. (*It is continuous, — unbroken.*) Repeat over the reversed curve and the other spirals; notice that the second movement is simply the reverse of the first. ***Alternation*** of effect is produced by this reversal of the ***repeat***. How many repeats are there in the border?

This border combines the graceful curvature and the tangential union of lines found in Greek ornament; and it is the basis of the ***scroll,*** which was developed and elaborated from the simple wave line into one of the most perfect decorative forms ever employed.

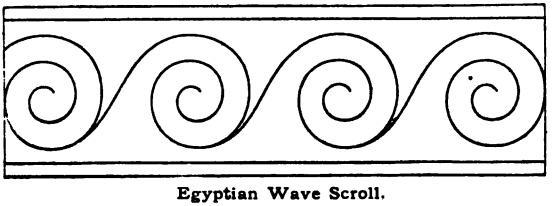
D. B., page **L. — Practice page for Ex. VII.**

Study of Construction Lines. — In the first repeat of the border on page 7 there are light lines; what is their purpose? (*To assist in laying out the figure.*) What are they called? (*Construction lines.*) On page L construction lines are given for the border, the outer marginal lines being omitted. Compare the construction lines on this page with those in the first repeat on page 7, and determine through what points the reversed curve should pass, — also the spiral curves.

Practice. — Practice movement over the reversed curve on page 7, then over the construction lines of page L, — then draw the curve continuously. Repeat for the spirals, beginning movement on the reversed curve and carrying it around over the spirals. Repeat this practice on the construction lines below.

D. B., page 7. **— Drawing the Border.**

Drawing. — Light enclosing lines for a border are printed. Draw lightly the inner marginal lines. Trisect the inner lines and bisect the left vertical. Draw the construction lines through the whole length of the border. Practice movement and draw as above. Erase construction lines and finish in soft, gray lines.



Egyptian Wave Scroll.

EXERCISE VIII. — Ivy Leaf. — Twelfth Century.

Three and five lobed ivy leaves brought in by pupils.

OBJECT. To study a Gothic ivy leaf, to compare it with natural leaves, to draw it.

Study of the Copy by Pupils. — Look first at the ivy leaves which you have; how many parts or ***lobes*** have your leaves? (*Some have three, some five.*) How many lobes has the copy given in the drawing book? Look at its centre lobe; has any one an ivy leaf having such curves in the centre lobe as those of the copy? Study the other curves of the copy in the same way.

The leaf given in the drawing-book is from a leaf found in early ***Gothic ornament,***— ornament of the ***twelfth century.*** Certain characteristics and leading curves of the ivy leaf were studied and reproduced, all minor details being omitted; and a conventionalized ivy leaf and tendril in the simple, strong, early Gothic style was produced.

Study the blocking-in given in Fig. 2. What is the general shape of the blocking-in? What is the proportion?

D. B., page **M. — Practice page for Ex. VIII.**

Practice. — Block in an oblong of the proportion shown in Fig. 2, p. 8, and of suitable size for the page, first indicating its height and width by light lines, then drawing the oblong. Draw the oblique lines as further aids in obtaining the shape of the leaf. Block in the midrib and lobes, and the tendril and draw the curves over the blocking-in lines. *Do not erase.*

D. B., page 8. **— Drawing the Leaf.**

Observation Exercises for Pupils. — This leaf (Fig. 1) looks strong and vigorous; it is apparently holding itself erect; how is this effect produced? (*By the strength in the drawing of the stem and midrib.*) This strength is seen (1) in the directness of the line of growth, the general direction of this line being easily expressed in but two straight lines; (2) in the breadth of the stem.

The figure looks well-balanced also. But if a central vertical were drawn, it would not divide the drawing into two corresponding parts; the effect of ***balance*** in the figure is not produced by repetition on an axis. Can you tell how this effect is produced?

Study the copy to discover why it looks well-balanced. Apparently the leaf-stalk and tendril first shot outward to the right, but the life and vigor within carried the leaf upward; the growth upward apparently counteracted and to a certain extent conquered the outward tendency; the two balance each other. This is all expressed by the direction of the leaf-stalk and midrib, holding up the leaf. The end of the leaf-stalk is left open, unfinished, to indicate that the whole form is not given; the curvature also indicates that the leaf is still receiving strength from the main branch, which adds to the impression of balance, and ***stability.***

Drawing. — Follow the directions for the practice page. Study to produce the effect of strength and balance in the drawing. Erase the blocking-in and finish in broad gray lines.

EXERCISE IX. — Decorative Design from the Bunchberry.

OBJECT. To draw a design for a rosette, using a plant-form as a motive.

Study for the Unit of the Rosette. — The design required is a rosette, having a square on its diagonals as the enclosing figure, the motive for the design to be taken from the bunchberry. Draw on the board two lines, a horizontal and a vertical, 2 feet long, crossing each other in the centre. Connect the ends of these lines by straight lines, drawing them by opposites. The figure is a square on its corner, the horizontal and vertical being its diagonals. As, in drawing a square on its corner, the diagonals are drawn first, it is also called a ***square on its diagonals.***

(In the study for the unit, the teacher should endeavor to lead the pupils to the following conclusions, by asking for opinions and reasons.)

This rosette should have but four units. The number of units should always be either equal or be a multiple of the number of sides of the enclosing figure. For the sake of simplicity (a very great beauty in decorative design, as it generally adds to the effect of repose) the smallest number of units is generally chosen.

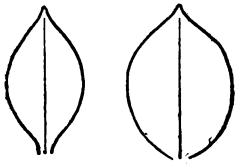
The units of this rosette should be placed vertically and horizontally; if placed obliquely, the *ground* of the design would not be well filled. The rosette should occupy about two-thirds of the ground.

The *field* of each unit should be considered, in order to determine the shape and proportion of the unit. In this case, by drawing the diameters of the square on the board, the fields for the units are shown to be squares on their diagonals. As the field of the unit is a square, the unit should be rather wide in proportion to its height.

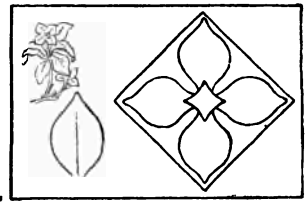
The motive of a design may be geometric, historic, or from plant-form. In this exercise the motive is a plant-form, the dwarf cornel or bunchberry. As this is a wild flower, growing in the woods and not accessible to all, an illustration is given in the drawing-book. In some respects, it is a curious plant. The flowers are very small, of a greenish color and clustered in a head, the cluster being surrounded by a four-leaved white *involucre* looking like a white corolla. The illustration shows a difference in shape and proportion between the leaves of the involucre and the leaves of the plant lower down on the stem. The varying curves and their subtile beauty should be studied.

D. B., page N. — Practice page for Ex. IX.

Practice. — Two verticals are printed as the axes of two units. On the first draw, from the leaf of the plant, a unit, open at the base; on the second, draw from the leaf of the involucre, a unit, open at the base.



D. B., page N, completed.



D. B., page 9, completed.

D. B., page 9. — Drawing the Rosette.

Study for the Design. — (The teacher should lead pupils to look for the whole effect as to proper filling of the space, as to ***simplicity,*** as to adherence to the motive, as to beauty of curvature, as to ***contrast*** and variety by proper balancing of curved and straight, rounded and angular, as to ***stability*** by union at the centre, as to harmony by the agreement of the parts and as to repose by the union of all these qualities.)

Drawing. — Draw a square on its diagonals in the space at the right, using the points given as the ends of the vertical diagonal. Add the diameters to make the fields for the units. Study the upper field; draw on the vertical, printed under the illustration, a unit from that leaf in the illustration that you think best fitted to fill the field. In drawing this unit, think not only of the beauty of curvature, but also of the character of curvature that seems to belong to the plant.

Draw four such units around the centre of the square, drawing them by opposites. Study the effect of the units and consider whether by changing the shape and proportion slightly, the effect would be improved. Remember that too many sharp points make an unpleasant figure, — that where the enclosing figure has a pointed effect, it is very seldom desirable that the unit should be of such a shape as to add to that effect.

Decide on and draw a central figure of suitable size to give the effect of stability; add to the harmony of the design, by making the central figure either a circle, or a figure having the same number of sides as the enclosing figure; add to the variety in the figure by change in line from the enclosing figure. Change the design where the effect seems to require it. Erase construction lines and finish in broad, gray lines.

EXERCISE X. — Cylinder and Square Prism combined. — Drawing the Facts. — Three Views.

OBJECT. To study and to draw the different views of two models combined.

Study of the Models by Pupils. — Place on a book the cylinder and square prism arranged as in the illustration in the drawing-book. What is the proportion of the cylinder? *1 to 2.* Of the square prism? (*1 to 2.*) How do the two models compare in size?

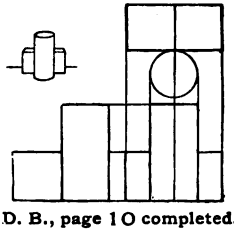
Lift the book until the top of the square prism is on a level with the eye and study the front view. What would you draw for the front view? (*A horizontal oblong, 1 to 2, its middle half hidden by a vertical oblong of the same size and on the same base.*)

Turn the left end of the book toward you; what would you draw for the left side view of the models? (*A vertical oblong, with a square of half its height touching it at the left and on a line with it at the base.*)

Turn the book as at first and then lower it so as to get the top view of the models. What would you draw for the top view? (*A horizontal oblong with a circle below it, touching the middle of the base of the oblong and having a diameter equal to half the base.*)

D. B., page O. — Practice page for Ex. X.

Practice. — A horizontal is given at the right for the base of the front view of the models. *Quadrisect* it, that is, bisect it and bisect each half. On the middle half draw the front view of the cylinder first drawing an indefinite vertical as a centre line; add that part of the square prism seen. An angle is given at the left for the left end of the base of the side view. Obtain the height of the two models by movement from the front view and draw light horizontals. Add the verticals necessary for the side view.



D. B., page 10 completed.

A quarter of an inch above the front view draw the top view, obtaining its width from left to right, by movement up from the front view.

D. B., page 10. — Drawing the Three Views.

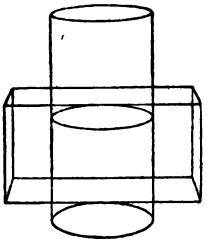
Drawing. — Follow the directions given for practice. Finish in soft, gray lines.

EXERCISE XI.—Cylinder and Square Prism.—Appearance below the Level of the Eye.

From Models.

OBJECT. To read a drawing of three views of two models, to place models in a corresponding position, below the eye; to study and to draw their appearance.

Study of the Drawing and the Models.—Read the drawing on page 11 of the drawing-book and tell what Figs. 1, 2, and 3 are. Place the models as indicated in Fig. 2 and below the eye. What is the proportion of the apparent height of the group to the apparent width? Which appears longer, the square prism from left to right, or the cylinder from top to bottom? Which appears longer, the nearer or the further edge of the top of the square prism? How does the apparent width of the top of the cylinder from front to back, compare with the top of the square prism? Consider what the apparent width from front to back, of the invisible horizontal faces of the two models would be, compared with each other and also with the width of the top faces. A knowledge of the invisible faces as here illustrated, is necessary in order to place the drawings correctly with regard to each other.



D. B., p. 11 completed.

D. B., page P.—Practice page for Ex. XI.

Practice.—Study the models carefully, taking measurement on the pencil (see second page of Drawing Book cover). Determine about the space to be occupied by the drawing on the page, by light indefinite horizontals and verticals. Draw the appearance of the cylinder, drawing a complete ellipse for the base. Draw the appearance of the square prism. Draw the table line, as seen on page 10, remembering that it should be above the further line of the base of the square prism, otherwise the group will appear as if projecting over the edge of the table and will give the impression of being insecurely placed.

D. B., page 11.—Drawing the Appearance.

Drawing.—Follow the directions for practice and finish the drawing in soft gray gray lines, making the farther lines a little fainter than the nearer ones.

EXERCISE XII. — Natural Growth. — From Nature.

Each pupil should bring a branch of leaves.

OBJECT. To study plant-form and growth from a natural branch.

Study of a Natural Branch by Pupils. — Notice the general character of your branch; is it sturdy, showing vigorous growth, or is it delicate? What is the general direction of the stem? Is it straight up, or straight forward? Or does it bend? Could you express its direction by one straight line, or would two or three straight lines be necessary in order to show changes in direction?

Study the Leaf Arrangement. — Are the leaves ***opposite*** each other or are they ***alternate?*** If they are opposite, see if all the leaves point either to the left and right, or if some point toward you and some point away from you. If they are alternate, notice in what direction they point.

Compare the distances between the leaves or between the pairs of leaves in various parts of the stem. Where is the distance the greatest? the least?

Notice the upper end of the branch; are there two leaves at the end or only one? Study also the terminal bud.

Stand a book on its end on the back part of your desk and stand the branch up between the leaves of the book at the top. Take pains to place the branch so that you have the most pleasing view. Look at the proportion of the width to the height of the whole mass.

You have learned that when you look at the top face of a cube or of any object, it does not appear as wide from front to back as it really is. This appearance is called ***foreshortening.*** Do any of the leaves on your branch appear *foreshortened?*

D. B., page **Q. — Practice page for Ex. XII.**

Practice. — Plan for a large drawing of your branch. Block in the stem by one or more straight lines. Indicate the shape of the whole mass by a few light lines. Block in the midribs of the leaves and the leaves themselves. Draw the curves of the stem and leaves over the blocking-in lines. Do not erase the blocking-in.

***D. B., page* 12. — Drawing the Branch.**

Observation Exercises for Pupils. — Compare your drawing on the practice page with the natural branch. Does the branch in your drawing look as though the leaves had been growing? If vigor seems to be wanting in the drawing, study the natural branch again to find out what it is that you have failed to see.

From which side does the light fall on your natural branch? Which is the dark side of the branch? Look at the illustration in the drawing-book; on which side did the light fall? How is this shown in the illustration?

Notice that you cannot in your natural branch see all the edge of each leaf distinctly. This can be expressed in your drawing, as in the illustration, by broken lines and lines of varying thickness. If your leaves are toothed, do not try to draw every tooth, — merely indicate a tooth now and then.

Drawing. — Follow the directions for practice. Erase the blocking-in lines where necessary. Finish in gray lines varying in thickness, making them darker on the side away from the light.

LANGUAGE.

TEACHERS should continue to give pupils practice in the use of the terms and names on pages 28, 54, and 88, as well as in the use of those given below, always requiring complete sentences.

Names of Models, Objects, and Details.

CONE; vertex, base, altitude; frustum.
TRIANGLE; isosceles; vertex, base, altitude.
SQUARE; on its diagonals.
SPIRAL; equable, variable; spire.
CURVE; reversed.
BOOK; title piece.
LEAF; opposite, alternate; lobe.
COLOR; flat wash, graded wash.

Terms of Construction.

FACTS; geometric view, dimension, foreshortening.
LINES; centre line, working line.
CONSTRUCTIVE DESIGN; proportion, profile curves.

Terms of Representation.

APPEARANCE; converge, foreshortening.
EDGES; receding.

Terms of Decoration.

BORDER; wave line, scroll.
ARRANGEMENT; repeat; alternation.
EFFECT; Balance, Stability, Simplicity, Contrast.
ORNAMENT; Egyptian Wave Scroll; Gothic, Twelfth Century.

BOOK V.

CONSTRUCTION. *Facts of Form.* **Working-Drawings.**	SOLIDS: Cube, Square Pyramid, Square Plinth, Square, Equi. Tri., and Hexagonal Prisms. OBJECTS: Writing Desk, Common Object. CONSTRUCTIVE DESIGN: Common Object. MAKING: Square Pyramid, Hexagonal Prism, Common Object.
REPRESENTATION. *Appearance of Form.* **Picture-Drawings.**	SQUARE PRISM, CUBE, SQUARE PLINTH. BOOKS, BOXES. NATURAL SPRAY OR BRANCH. COMPOSITION: Group of Models and Objects.
DECORATION. *Ornamentation of Form.* **Original Design.**	HISTORIC ORNAMENT; Fleur-de-lis. NATURAL GROWTH: Spray or Branch. DECORATIVE DESIGN: Modification of Units, Borders, Panels.

DRILL EXERCISES.

Drawing-Book, *page* A.

OBJECT. Practice for proper position, pencil-holding, and free arm movement, horizontal, vertical, oblique.

Directions to the Teacher. — Before beginning work in the book, be sure that pupils know how to hold their pencils for free movement and drawing. Give practice in movement with the pencil in each direction, and see that *each pupil* holds the pencil properly (see Figs. 1, 2, 3, 4, p. xiii).

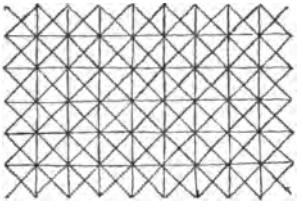
Practice. — Draw horizontals from *a*, *b*, *c*, *d*, *e*, ending these lines directly below 9.

Draw verticals from 1, 2, 3, 4, 5, 6, 7, 8, ending these lines directly opposite *f*.

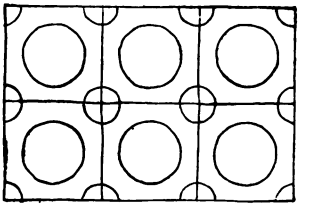
Draw an oblique line from 1 to *a* and lines parallel to it, from 2, 3, 4, 5, 6, etc., as in page A, completed.

Draw an oblique from *e* to the lower end of the vertical drawn from 1 and lines parallel to it from *d*, *c*, *b*, *a*, 0, 1, 2, 3, 4, etc., as in page A, completed.

Practice arm movement for each line before drawing. *No erasing.*



D. B., page A, completed.



D. B., page B, completed.

Drawing-Book, *page* B.

OBJECT. Practice in laying out a page, — giving a suggestion of surface covering, — proper position, pencil-holding, free arm movement, horizontal, vertical, circular.

Study of the Oblong. — Turn to **D. B.**, page 1, and study the oblong made by the marginal lines. What are the dimensions of this oblong? How wide is the margin of the page at the top and bottom? at the left and right?

Practice. — Free movement, free drawing. Lay out the page according to the directions for Practice at the top of page 91. In each square draw a circle 2″ in diameter. Finish, as in the illustration, p. 120, page B, completed, by drawing circles 1″ in diameter, semicircles, and quadrants; or, if you prefer, as in illustration, p. 90, page B, completed.

Drawing-Book, *page* C.

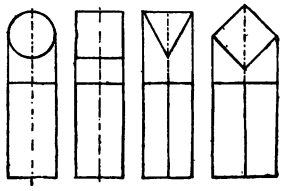
OBJECT. To give a slight review of previous work in Construction; the top views of familiar models and their names being given, to draw the front view.

Study of the Page by Pupils. — Name the figures on the page. (*Circle, square, equilateral triangle, square on its diagonals.*) These figures are top views of geometric solids, well known to you; the solids are all of the same height. Fig. 1 is the top view of a cylinder; the proportion of width to height of the cylinder is 1 to 2; what would you draw for the front view? (*An upright oblong of the proportion of 1 to 2.*) Fig. 2 is the top view of a square prism. What would you draw for the front view? (*The same as for the cylinder.*) Fig. 3 is the top view of an equi. tri. prism; how many vertical edges would you see in the front view? What would you draw for the front view? (*An upright oblong with a vertical line through the centre.*) Fig. 4 is the top view of a square prism, turned at an angle of 45°; how many vertical edges would you see in the front view? What would you draw for the front view?

A centre dot-and-dash line is printed for the two views of the cylinder. Centre lines are frequently made dot-and-dash lines, to distinguish them from working lines and from the details of the object.

Practice. — As these solids are all of the same height, two horizontals across the page will serve to give an upper and a lower line for all the front views. Begin ¼″ below the lower corner of the square on its diagonals, move horizontally to the left edge of the page, then draw a horizontal across the page.

Lay out the front views, by drawing centre lines, and light verticals downward from the top views. Finish the front views in gray lines.



D. B., page C, completed.

CONSTRUCTION.

EXERCISE I. — Cube facing. — Cube turned. — Square Pyramid turned.

MODELS. — *Cube, Cone, Square Pyramid.*

OBJECT. To study the form of a square pyramid; to study and to draw the facts of a square pyramid facing, and of a cube and a square pyramid turned at 45°.

Study of the Model by Pupils. — Here is a group of three models; name them if you can. Does the new model resemble more the cube or the cone? In what respect is it like and in what unlike the cone? It is called a ***pyramid.*** In what respect is it like a cube? (*It has a square base.*) Hence it is called a *square pyramid.*

Making the Model. — Turn to page S, cut out the pattern, fold and paste to make a hollow pyramid.

Place the pyramid upright and facing you. Look directly down on it; what do you see? (*A square.*) What else? (*A point and oblique edges.*) Where shall the point be made? (*In the centre of the square.*) Find one of these edges on the model, and trace its whole length with your finger. From what point in the top view does it start? (*The centre.*) Where does it end? (*At a corner of the base.*) In this way study the whole of the top view. What should be drawn for the top view? (*A square and its diagonals.*)

What is the shape of the front view? (*An isosceles triangle.*) The altitude of the pyramid, that is, the distance from the vertex to the centre of the base, gives the height of the front view. Stand the model on the desk, rest a book horizontally on the vertex, and measure the vertical distance from the book to the desk. Compare this distance with the ***slant-height*** of the pyramid, that is, the distance from the vertex to the centre of one of the edges of the base, and also with the length of an oblique edge of a triangular face.

Study the pyramid *turned*, in the same way.

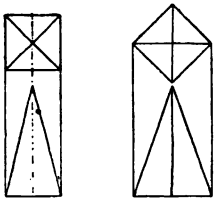
***D. B., page* D. — Practice page for Ex. I.**

Practice. — *Pyramid facing.* A horizontal is printed for the base of the front view

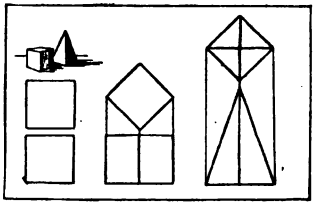
of the pyramid. A centre line is also printed. Fix a point on the centre line for the vertex of the front view, making the altitude of the pyramid twice its width, and draw the sides. From each end of the base, move upward nearly to the top of the page, and draw a light vertical downward to the base.

Above the front view, draw the top view of the pyramid facing, placing the centre of the view on a level with the cross printed at the right.

Pyramid turned at 45°. Draw an indefinite centre line through the given point, the centre of the cross. Using the given point as centre, draw the top view, — a square on its diagonals, making the diagonals equal to the diagonals of the top view of the pyramid facing. Draw indefinite verticals downward from the left, lower and right corners of the top view, and draw the front view, making its height equal that of the front view of the pyramid facing.



D. B., page D, completed.



D. B., page 1, completed.

***D. B., page* 1. Drawing two views of Cube and Pyramid turned.**

Observation Exercises. — Turn your models at angles of 45°. Did you ever see any object in which there was a cube or a pyramid turned? What would you draw for the top view of the cube turned at 45°? (*A square on its diagonals.*) Of the pyramid turned? (*The same, with its diagonals.*) How many edges are visible in the front view of the cube turned? (*Seven.*) Of the pyramid turned? (*Five.*)

Drawing. — The front and top two views of a cube are given, to show the size of the drawings to be made.

Cube turned. — A centre line and the centre of the top view are given. Follow the directions given above for the top view of the square pyramid turned. Draw light verticals down from the left, lower and right corners, and complete the front view.

Pyramid turned. The centre of the top view is given. Draw according to directions given for practice.

Finish the top and front views in gray lines.

EXERCISE II. Writing-Desk. — Three Views. — Dimension Lines.

MODELS: *A brick or a block of the same size and proportion; a small writing-desk, if practicable.*

OBJECT. To make three views of a writing-desk, giving not only the facts of its form, but also its size; to make a "figured" drawing.

Study of the Brick by Pupils. — Here is a brick, resting on its long, broad face, the long, narrow face in front of you. You wish to make in your drawing-book a drawing, from which a carpenter could make a block, having the same form. What are its dimensions? (*2″ thick, or high, 8″ from left to right, 4″ from front to back.*) How many inches wide is your drawing-book? Is it wide enough to make the left end and front views full size? What can you do then? (*Make the views of the same proportions as in the object, and mark the size.*) What is the shape and proportion of the front view? (*A horizontal oblong, of the proportion of 1 to 4.*) Of the left end view? Of the top view?

Open your books at page E and see how the dimensions are marked there. The dotted lines with a dimension marked in the centre are called ***dimension lines,*** — the arrow-heads show the limits of the dimension. Such a drawing is called a "***figured***" drawing, because the dimensions are given in figures. Note the short dotted lines extending from each view, for the purpose of carrying the dimensions out a little from the view. Note also that the top view is as wide from front to back as the end view is from left to right. A drawing which shows, as this does, the facts of *form* and *size* of an object is called a ***working-drawing.***

Study for laying out the page. — On this page you wish to make a large drawing of the three views. How many inches would you have horizontally, if you should leave margins like those on page 2? How can you plan for a left side view, and for a front view twice as wide as the side view? (*Make the margin at left and right, ¼″ narrower so as to make the width of the space for the drawing, 9½″; then make the end view 3″ and the front view 6″, leaving ½″ space between these two views.*)

D. B., page E. — Practice page for Ex. II.

Practice. — Draw a horizontal across the page, $\frac{1}{2}''$ above the lower edge of the page. Place points on it for left and right margins and for left end, and front views. Determine the proper height of these views and draw another horizontal across the page.

From the points made on the lower horizontal for the left end view, move upward to the upper horizontal, and draw verticals downward to the lower horizontal, thus completing the left end view.

Complete the front view in the same way by verticals.

From each end of the front view move upward nearly to the title, and draw verticals to the verticals of the front view. Draw a horizontal for the base line of the top view $\frac{1}{2}''$ above the front view, determine the proportion of the top view and draw the upper horizontal. Add the dimension lines and figures.

D. B., page 2. Drawing three views of a Desk, figured.

Observation Exercises for Pupils. — What object does the working-drawing on this page represent? ***Read*** the drawing, that is, tell what it means. (*The drawing shows the front, left and top views of a writing-desk, 6″ high, 12″ from back to front, 18″ from left to right. The front view shows that the upper part of the desk is 2″ high at the front and the lower part 4″ high. The left end view shows that the upper and lower parts are each 3″ high at the back; and that the desk when opened, would slant from 4″ high at the back to 2″ high at the front.*)

Can you make a desk from this drawing? If you try, remember that the piece for the bottom should not be as large as that for the top — allowance should be made for the thickness of the sides. For the same reason, the pieces for the ends should not be as long as the end view in the drawing.

Drawing. — Lay out the views according to the directions given for Practice. Finish the views in broad lines; add the dimension lines and figures.

EXERCISE III. — Hexagonal Prism. — Three Views.

MODELS: *Square Prism, Hexagonal Prism.*

OBJECT. To study and to draw the facts of the form of a hexagonal prism, and also the construction of the plane figure derived from it, — the hexagon.

Study of the two Models. — What name, common to both, have these two solids? (*Prism.*) How many oblong faces has each? (*The square prism has four, the other has six.*) How many sides has the base of the square prism? How many has the base of the other prism? How many angles? The base is called a ***hexagon*** because it has six sides and angles, and as all the sides and angles are equal it is called a ***regular hexagon.*** As prisms are named from their bases, this prism is called a ***hexagonal prism.***

Draw a horizontal on the board; quadrisect it, and beginning some distance above the horizontals, draw indefinite verticals through the two outer points. On the left vertical place a point as far from the left end of the diagonal as the distance between the verticals, — repeat below. On the right vertical place points on a level with those on the left. Draw the hexagon.[1] Describe the diameter of a circle; of a square: the diagonal of a square. Where would the diagonal of a hexagon run? (*From one angle to an opposite angle.*)

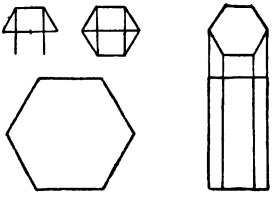
Making the Model. — Detach page K, cut out the pattern, fold and paste to make a hexagonal prism. What would you draw for the top view of the upright prism? (*A regular hexagon.*) How many vertical edges are there in the front view? (*Four.*) Draw the front view on the board, first verticals from the four lower angles of the hexagon — then horizontals for the top and base lines of the front view. How high should it be? (*Twice as high as the diagonal of the hexagon.*)

[1] If you have preserved page C of your drawing-book, cut out the printed circle, — fold it through the middle and crease it. Keeping it folded as a semicircle, fold it from the centre so as to make three equal parts and crease the folds. Opening the circle, you will find three diameters. Fold over the curved edge from the end of one diameter to the end of the next, — repeat five times. You will have then a regular hexagon with three diagonals. Fold the end of one diagonal over to the centre of the figure and crease, — fold the other end of the same diagonal to the centre and crease. Open the hexagon, — the folds just made divide the semidiagonal in the middle and end just at the ends of the diagonals on either side. Open your drawing-book at page F, and you will see there the folds illustrated.

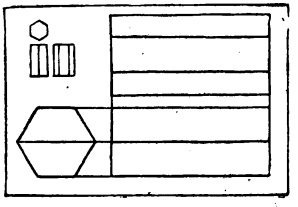
D. B., page F. Practice page for Ex. III.

Practice. — *Hexagon.* Points are given for a horizontal. Draw the horizontal and complete the hexagon, as above.

Hexagonal Prism. The top view is printed. Draw the front view, as above.



D. B., page F, completed.



D. B., page 3, completed.

D. B., page 3. — Drawing three views of the Hexagonal Prism.

Observation Exercises for Pupils. — Read the illustration. (*Three views of an upright hexagonal prism, with the edge toward you.*) Look at the top view; how many angles in the front half? How many vertical edges in the front view? in the right side view? How wide is the front view? (*As wide as the length of the diameter of the top view.*) How wide is the side view? (*As wide as the length of the diagonal of the top view.*)

Place the prism horizontally from left to right. What would you draw for the end view? for the front view? for the top view?

Drawing. — *End View.* Points are given for a horizontal diagonal for a hexagon. Draw the diagonal and complete the hexagon according to the directions above.

Front View. From the three angles on the right half of the hexagon draw indefinite horizontals. On the centre horizontal fix points for the length of the front view. From each point move upward to the upper horizontal and draw downward a vertical to the lowest horizontal.

Top View. From each end of the front view move upward nearly to the title and draw verticals downward to the verticals of the front view. On the left vertical fix points for the left end of the top view, making it equal to the diagonal of the end view; fix points also for the width of the other two faces seen in the top view; draw four horizontals to complete the top view.

Finish the three views in broad, gray lines.

REPRESENTATION.

EXERCISE IV. — Square Prism and Cube turned at an angle of 45°. — Appearance.

MODELS: *Square Prism, Cube.*

Previous to this lesson each pupil should make from pasteboard or thick paper, a model of a square prism and a cube — the base of each 4″ on a side — the altitude of the square prism 8″.

OBJECT. To study and to draw the appearance of a prism and a cube turned at 45°.

Study of the Models by Pupils. — *Square Prism.* Place the prism turned at an angle of 45° on a pile of books, so that the middle of the prism will be on a level with the eye. Fold some rather stiff paper to make two strips about ¾″ wide and 5″ or 6″ long.[1] Hold the strips in one hand so that one strip can be kept vertical and the other easily moved up or down like the handle of a pump. Hold the strips at arms' length, so that the inner point of intersection will be between the eye and the nearest upper corner of the model and so that the edge of the vertical strip will cover the nearest vertical edge of the model; then move the other strip up or down until it inclines as much as the horizontal edge *appears* to incline. Keep the strips parallel to the plane of your face. Study the other receding edges in the same way.

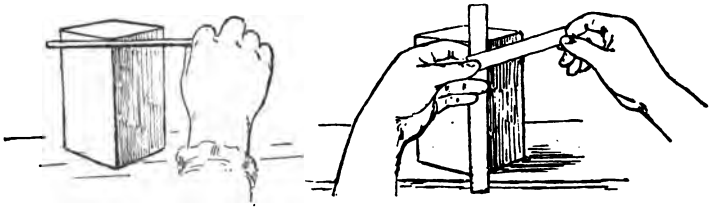
Compare now the apparent length of the vertical edges by measurement on the pencil; also the height and the width of the appearance.

Cube. Place the cube so that the top is on a level with the eye and study it in the same way. How do the lower receding edges appear? (*Slanting upward toward the level of the eye.*) Which appears longer, the nearer or the farther vertical edges?

Study edges both above and below the eye, the edges of an open door, pictures on a side wall, books, boxes, tables, etc., all turned at an angle, and note that all retreating horizontal edges above or below the eye, appear to slant, — those above the eye appearing to slant downward, and those below the eye appearing to slant upward.

[1] The blank pages in the middle of the drawing-book are intended for any use that the teachers may require. The strips can be taken from one of the blank pages.

(The illustrations show the use of a pencil in discovering the apparent direction of receding edges and of the strips of paper.)

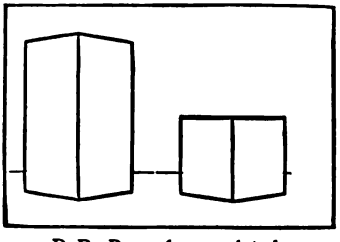


***D. B., page* G. Practice page for Ex. IV.**

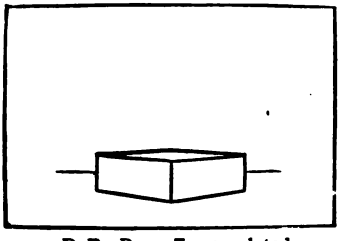
Practice. — Upon the left of the page, make a large drawing of the appearance of the square prism, placed so that the middle is on a level with the eye, — on the right of the page, a large drawing of the appearance of a cube, standing on a level with the square prism, having the top on a level with the eye.

Square Prism. Indicate the height and width of the drawing by light lines, noting the horizontal printed for the level of the eye. Draw the vertical for the nearest edge. Draw upper edges, then lower, slanting as much as they appeared to, when the strips of paper were used — then left and right verticals. Draw a table line.

Cube. Draw the cube according to the directions for the square prism. Draw a table line.



D. B., Page 4, completed.



D. B., Page 5, completed.

Observation Exercises by Pupils. — Read the drawings, Figs. 1, 2, and 3. Study again the square prism and the cube as above.

***D. B., page* 4. — Drawing the appearance of the Prism and the Cube.**

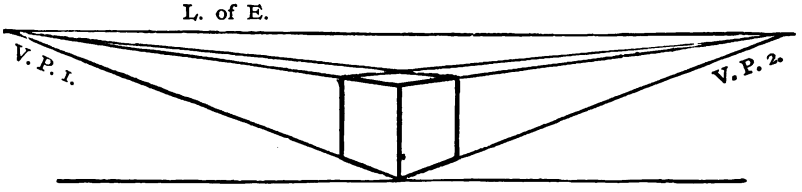
Drawing. — Follow the directions for Practice. Finish in broad, soft, gray lines.

EXERCISE V. — Square Plinth turned at an angle of 45°. — Appearance below the level of the eye.

MODELS: *Square plinth, base 6″, side 2″, made by the pupil.*

OBJECT. To study and to draw the appearance of a square plinth below the level of the eye, turned at 45°.

Study of the Model by Pupils. — Place the square plinth turned at 45° so that its base will be as far below the eye as the base of the cube in the preceding exercise. Study its appearance by the methods suggested in Ex. IV.



(Lead pupils to state during the study of the model that —

1. All retreating horizontal edges appear to incline toward the level of the eye, and must be so drawn.
2. All parallel horizontal edges retreating from the eye appear to converge to a point on the level of the eye, and must be drawn so that, if produced, they will meet in a point on the Level of the Eye (L. of E.)
3. Parallel horizontal edges retreating to the left appear to converge to a point on the level of the eye at the left of the object; those retreating to the right appear to converge to the right ot the object. These points are called respectively Vanishing Point 1 (V. P. 1) and Vanishing Point 2 (V. P. 2).
4. For rectangular objects standing at an angle of 45°, V. P. 1 and V. P. 2 are equidistant from the object.
5. The farther vertical edges appear shorter than the nearer, and must be so drawn.)

D. B., page H. **Practice page for Ex. V.**

Practice. — Draw the appearance of the square plinth turned. Remember the level of the eye. Follow the directions for the square prism, Ex. IV.

***D. B., page* 5. Drawing the appearance of the Square Plinth.**

Drawing. — Follow the directions for the square prism, placing the drawing so that it will be on a line with the drawing on page 4.

EXERCISE VI. — Rectangular Object turned. — Appearance below the level of the eye.

MODEL: *Book or Oblong Box.*

OBJECT. To study and to draw the appearance of a rectangular object below the level of the eye turned at an angle of 45°.

Study of the Object by Pupils. — Place a book or a box in the position required and study the appearance as in previous exercises. Draw the book, first as if it were a block with vertical edges — then add the curving out of the back and the curving in of the leaves.

***D. B., page* 1. — Practice page for Ex. VI.**

Practice. — Make a large drawing of the appearance of a book or a box, placed as required. Consider first the level of the eye. Follow the directions in Ex. IV.

***D. B., page* 6. Drawing the appearance of a rectangular Object turned.**

Observation Exercises for pupils. — Are the edges of your book a little broken or bent anywhere? If so, break your lines a little in the drawing.

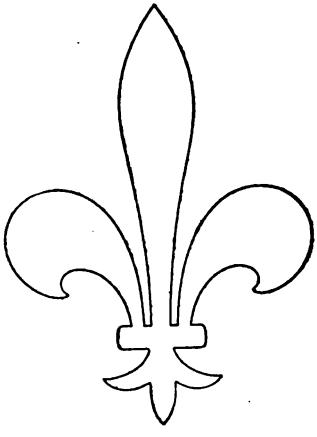
Drawing. — Follow the directions for Practice. Finish the drawing in broad, soft gray lines, breaking them occasionally, if the edges of the book are worn.

DECORATION.

EXERCISE VII. — Fleur-de-lis.

OBJECT. To study and to draw an example of good historic ornament.

Study of the Copy by Pupils. — What is the name given in the drawing-book to Fig. 1? to Fig. 2? to Fig. 3? Have you ever seen the flower called Fleur-de-lis? Do you remember how some of its petals curve and curl? It is not known that the ornament called the Fleur-de-lis was taken from this flower; but the curves at the left and right sides of the ornament are like the curves of the curling petals of the flower.



This ornament has been, like most favorite ornaments, variously modified, in different ages and countries, but it is readily recognized under the various modifications, having always the broad, erect blade in the middle, the gracefully curving sides, generally a band or a semblance of it, and a spreading base as in Figs. 2 and 3. The upper part only of a Florentine Fleur-de-lis is given in the the drawing-book. The complete figure is here illustrated; also a surface covering in which a different Fleur-de-lis is used, from the walls of Ste. Chapelle, Paris.

D. B., page J. — Practice page for Ex. VII.

Practice. — Draw blocking-in lines on Fig. 1, p. 7. On the left half of page **J**, draw simply the centre line, connecting the points given and two horizontals, one for the greatest width of the figure, and one for the base, then the blocking-in lines, studying carefully the various proportions.

On the right half of the page, one-half of the fleur-de-lis is given. Draw its blocking in lines. Repeat them to balance on the right. Draw the curves on the right, first practicing movement on the printed copy.

D. B., page 7. — Drawing the Fleur-de-lis ornament.

Observation Exercises by Pupils. — What is the proportion of Fig. 1? About how high can you make your drawing in the space at the right, leaving a suitable margin at the top and bottom?

Drawing. — Draw Fig. 1, enlarged to fill the space at the right. First draw a light centre line, then blocking-in lines. Before drawing each curve, practice movement to get the feeling of the curve. Erase the centre and blocking-in lines and finish the Fleur-de-lis, in broad, gray lines.

EXERCISE VIII. — Unit of Design — Modification of Unit.

OBJECT. To study and to draw modifications of a familiar unit.

Study by Pupils. — Open your drawing-books at p. 8. Fig. 2 is a unit which is already familiar to you by its use in previous books; its base is simply a point. A vertical figure resting on a very sharp point gives an unpleasant impression of being insecurely placed. How is this unit modified in Fig. 3? (*Its shape is made more pleasing by the substitution of curved lines for straight; and it is broadened at the base giving the impression of greater stability.*) Do you remember the form of a tree, — the strong trunk, the broad branching at the top, and the spreading roots at the base?

How is this unit modified in Fig. 4? (*By division in the upper part and at the base.*) The divisions of Fig. 4, a partially divided figure, are held together by the strong undivided stem, as the trunk of a tree holds the branches together. If the divisions are carried too low, there will be an apparent tendency to split, and thus the strength of the unit will be lost. If the trunk or stem is made too slender, the unit becomes painfully weak. In a tree, the trunk is generally very slender in proportion to the width of the branching, but in a tree the strength comes from the growing life. In a figure, strength must be expressed in the trunk or stem by a greater proportional width. Note the proportional width of parts in the unit.

How is this unit modified in Fig. 5? (*The unit is wholly divided, and the stability is obtained by holding the parts together by a band.*) The band should be placed at the narrowest part of the unit. What would be the effect if there were no band?

D. B., page M. — Practice page for Ex. VIII.

Practice. — Construction lines are given for two units. On the figure, at the left, draw Fig. 1, page 8, on that at the right an original modification of it. Be careful about breaking the outline too much, and making too many sharp points which are unpleasantly suggestive of thorns and briars.

D. B., page 8. — Drawing a Modification of the Unit.

Drawing. — Draw Fig. 1, lightly in the space at the right. Modify the shape of the unit by changing the general lines or by rounding angles. Avoid irregularities and many sharp points. Erase construction lines and finish the modification in broad, gray lines.

EXERCISE IX. — Decorative Design. — Border.

OBJECT. To study the modification of units for borders; to design and to draw a border.

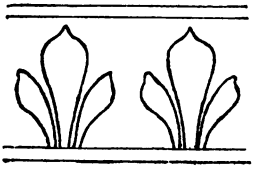
Study of the Modification of Units. — Open your drawing-books at page 9. What is Fig. 1? (*A border made by the repetition of circles.*) Fig. 2? (*A border made by the repetition of Fig. 1, p. 8, modified.*) How is the the unit changed? (*The lower part is cut of, giving the effect of greater stability.*) Describe Figs. 3, 4, 5 and 6. Do the units of Figs. 2 and 5 and of Figs. 3 and 6 resemble each other? (*The units of Figs. 2 and 5 show the blocking-in of the units of 3 and 6.*)

D. B., page N. — Practice page for Ex. IX.

Practice. — Draw on the first centre line, one of the units which you drew for Ex. VIII, modifying it for a border, first blocking it in. Repeat the unit on the second centre line.

D. B., page 9. — Drawing a Border.

Drawing. — Through the points given, draw long horizontals as marginal lines for a border, extending as far to the left and right as the borders above. Trisect the third horizontal from the top and bisect each division. Beginning a little below the second horizontal, draw to each point of bisection a vertical as a centre line for a unit. On these lines, repeat the unit, drawn in the border on page N, blocking-in first. Erase the centre and blocking-in lines and finish in broad, soft, gray lines.



EXERCISE X. — Working-Drawing.

OBJECT. To study and to draw the facts of form with the dimensions, of a common object — that is, to make a working-drawing of the object.

Study by Pupils. — Decide on a simple object that you desire to make, a box, a toy sled, a footstool, a tray, a toy house, book shelves, a picture-frame, a mallet, a toy trunk, or something similar. Think of the proportions and the form that you wish the object to have, and determine the size. If the object is to be suited to a particular purpose, remember to adapt the form to the purpose; if the object is to answer a general purpose, do not decide at random on any form that occurs to you, but try to think of a form that will be pleasing, — strive for beauty of form.

Make sketches of the shape of three views of the object as you have conceived it, — add the details, — and "figure" the drawing.

D. B., page O. — Practice page for Ex. X.

Practice. — Study the space and lay out the page for as large a drawing of the three views as the space will allow. Draw the three views from your sketches, adding "figured" dimension lines.

D. B., page 10. — Making a Working-Drawing.

Drawing. — Draw and finish the three views drawn on page O.
Making. — Make the object from the drawing.

EXERCISE XI. — Group of Objects.

OBJECT. To arrange a pleasing group; to study the appearance of the group, to draw the appearance.

Arrangement of a group by Pupils. — Arrange a pile of books or a group of three simple objects, studying to make the group as pleasing as possible in general effect. A pile of books can be arranged so as to have a very good and picturesque effect, — if you arrange them so that there will be Unity, Variety and Repose in the whole.

In arranging a group (see p. 68), remember to consider:

1. The place of the principal object.
2. The place of the secondary objects.
3. The figure made by the group on the table.
4. Partial view of some of the objects.
5. Upper line of the group.
6. ***Unity, Variety*** and ***Repose*** of the group.

***D. B., page* P. — Practice page for Ex. XI.**

Practice. — Having arranged a group, obtain the proportion of the width to the height of the group, by measurement on the pencil. Indicate by light lines the space to be occupied by the group, of a suitable size for the page and of the proper proportion. Consider and represent the level of the eye. Block in first the principal object, and then the others. Draw the table line, studying to place it well. Draw the curves over the blocking-in lines. Do not erase or finish.

***D. B., page* 11. — Drawing the Outlines of a Group.**

Observation by Pupils. — Describe the illustrations in the drawing-book with reference to the points mentioned. Improve the arrangement of your group if you can.

Drawing. — Follow the directions given for practice. Correct, erase wrong lines, and finish in broad, soft, gray lines, varying in thickness and clearness according to the character of the edges and profiles, and according to the distance of the edges from the eye, making the nearer parts the stronger.

EXERCISE XII. — Decorative Design.— Panel.

OBJECT. To study and to draw a spray or branch of leaves or flowers from nature — to draw a unit and a border for a panel, using the leaves and flowers as motives.

Study of a Spray or Branch. — Place the spray or branch in a book, as described p. 114. Notice the general character of your branch; is it sturdy, showing vigorous growth, or is it delicate? What is its general direction? Notice how the leaves and flowers are placed on the stem, how they spring from the stem, and in what order they appear. Notice any foreshortening. Study the light and dark side.

Study for the Unit in the Panel. — The unit for the panel can be made, either by modifying the unit already given, by the use of curves selected from the spray, or by showing the character of the plant in a unit made by conventionalizing the spray. The unit may be cut off at the base, as in the border, Ex. IX., to express stability.

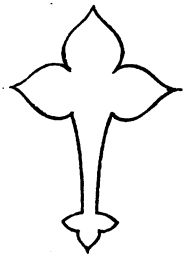


Fig. 1.

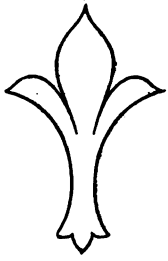


Fig. 2.

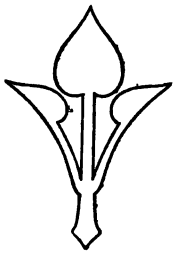


Fig. 3.

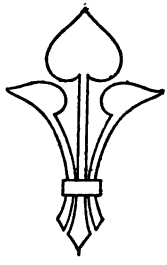


Fig. 4.

Figs 1 and 2 are modified by curves selected from the lilac leaf; Fig, 3. shows a unit modified from a spray of lilacs, showing its sturdy growth; Fig. 4, a unit from violet leaves conventionalized, retaining the delicate growth of the plant.

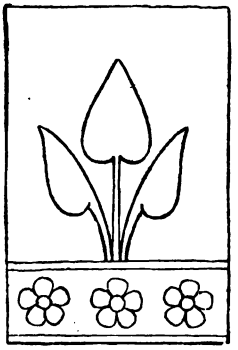
***D. B., page* Q, — Practice page for Ex. XII.**

Practice. — *Branch.* Plan for a large drawing on the left half of the page. Block in the stem and the shape of the whole mass by a few light lines. Block in the midribs and outlines of the leaves. Draw the curves of the stem and leaves over the blocking-in lines. Do not erase the blocking-in.

Unit and Rosette. On the upper part of the right half draw a unit, suitable for the upright oblong on p. 12, modified by some of the curves found in the leaves of the branch or spray; below it, draw a rosette, using the flower as a motive.

D. B., page 12. — Drawing the Branch or Spray and the Panel.

Study for Character of Lines by Pupils. — Notice that you cannot in your natural branch see all the edge of each leaf distinctly. This can be expressed in your drawing, as in the illustration, by broken lines and lines of various thickness. If your leaves are toothed, do not try to draw every tooth, — merely indicate a tooth now and then.



Suggested for a Panel.

Drawing. — Follow the directions for Practice. Erase the blocking-in lines where necessary. Finish the branch in gray lines varying in thickness, making them darker on the side away from the light. Finish the panel and design in broad, gray lines.

OPTIONAL COLOR EXERCISE.

The primary, secondary, and tertiary colors have been given and their use in flat washes. Practice in the use of the primary colors in graded washes have been given. In these graded washes, ***tints*** of the primaries were brought out, a ***tint*** of any color being a tone of the color lighter than the standard.

It is now proposed to introduce ***shades*** of color, a ***shade*** of any color being a tone of any color darker than the standard, and being produced by the mixture of black with that color.

The term ***tone*** of color is applied either to a tint or to a shade.

D. B., page R. — Drawing and Coloring a Design.

Drawing and Coloring. — Draw the panel which you drew on page 12. Color the panel with a tertiary color using three *shades*.

LANGUAGE.

TEACHERS should continue to give pupils practice in the use of the terms and names on pages 28, 54, 88, and 118 as well as in the use of those given below, always requiring complete sentences

Names of Models, Objects, and Details.

SQUARE PYRAMID; vertex, base, altitude; slant height.
HEXAGONAL PRISM; base, hexagon, regular hexagon.
COLOR; tint, shade; tone.

Terms of Construction.

WORKING-DRAWING; to *read* a working-drawing.
LINES; dot-and-dash lines, figured dimension lines.
CONSTRUCTIVE DESIGN; fitness to purpose, beauty of form.

Terms of Representation.

LEVEL OF THE EYE; L. of E.
VANISHING POINT; V. P. 1; V. P. 2.
SHADE; light, dark.
EFFECT; picturesque.

Terms of Decoration.

ORNAMENT; Fleur-de-lis.
MODIFICATION OF UNITS; division, band.
ARRANGEMENT; panel; unit and rosette.
EFFECT; Harmony.

APPENDIX.

COLOR.

Color having been accepted by leading educators as an important means of acquainting a child with his surroundings and of promoting his mental development, some provision should be made in all schools for its study. It is a subject, however, which is in its infancy in general education; all knowledge of color now possessed has been gained in the main either incidentally or by special study, and not from direct instruction in the school-room as a part of regular work. For the present, therefore, color-work in schools must be considered as experimental and tentative. The suggestions offered here, as an aid to such experimental work, are based on the most advanced scientific knowledge of the subject and upon artistic methods of work.

Lessons in color should be given not only for the sake of the knowledge of color to be gained and the pleasure and profit to be derived therefrom, but also as a means to be used in developing ideas of form; for color adds greatly to the attractiveness of form, and is therefore a great aid in leading to an appreciation of form, especially among children. Hence, a slight provision for the introduction of color has been made in the Books and Manual of this course in Form study and Drawing. The suggestions added in this Appendix are for the benefit of those who wish and are able to give more time to the development of color-work.

Color-lessons should not be given at random. They should have an orderly succession and should have a two-fold purpose: 1. The development of the color-sense; 2. The development of the power of expressing with brushes and paints, or other color materials, the color-impressions made upon the brain.

The ability to receive color-impressions and the ability to express them, are so nearly related that it is hardly possible to dissociate them in teaching color; but these two, Cultivation of the color-sense and Expression of ideas by color, should be considered separately in devising a plan for color-lessons.

The Color-Sense.—In all schemes for color-lessons, the color-sense should be made the starting point. Care should be taken that a color, impression or sensation should *always* precede the *name* of the color. To this end, exercises in matching colors of objects should be given before color-names are given. Provision has been made for such exercises in the Color Chart and Cards for the Primary Education of the Color-Sense by Dr. Hugo Magnus and Dr. B. Joy Jeffries; published by the Prang Educational Company.

In the Manual for this chart Dr. Jeffries says: "The systematic education of the color-sense has therefore in view the teaching of children by direct observation and the awakening in them a perception of the principal colors, as also their relation to light and shade."

In an article on Color names, Color-Blindness, and the Education of the Color-Sense in our Schools, published in *Education*, March, 1872, Dr. Jeffries further says:—

"Colors must be taught, and not simply the color-names of colored objects. A blind child will give the name of the color of grass, trees, apples, bananas, bricks, its companion's clothes, and perhaps even hundreds of objects the color-name of which it has learned. So also the color-blind boy will do the same. It is one thing to learn the color-name connected with a remembered *object*, and a very different thing to connect the right name with the sensation a green color arouses. Here has been the mistake, which object-teaching has rather fostered than corrected."

"Any method must be systematic and thorough, commencing at the very bottom. How little was accomplished in educating the ear, the voice, and the sense of form for the eye, till correct principles were understood and acted on. Nothing can be accomplished in color-teaching till the mistakes of the past are understood, admitted, and corrected. The very means adopted have but helped to blind the teacher and the educator in the belief that colors were being taught, when, in reality, nothing but names associated with certain objects were being remembered. The color-blind boy can, as I have seen, point out the colors in the charts heretofore used, as well as the normal-eyed. A certain spot in a certain position on a large card has a name attached to it which he remembers, and this is all he has learned. It is very true that many a teacher, disgusted with the charts, blocks, etc., placed in her hands, has discarded them all, and gathered together larger or smaller collections of colored paper, worsted, ribbons, etc.; but no exercise with these has revealed the characteristic mistakes of the color-blind boys she has taught. I have detected color-blindness among the best-taught classes,

I have witnessed the best color-teaching, and there was really nothing in it which would inevitably detect a defect of the color-sense. It would not have astonished me at all to have found, on trial, one of the exhibited boys color-blind. I found in a factory a color-blind man engaged in cutting up colored board into cards. His fellow-workmen would not, of course, admit his defect, but his employer had experienced a 'destruction of stock,' and could appreciate the characteristic mistakes he showed with Holmgren's test, etc. It is not expected that this idea of the need of connecting a name with a sensation will be received at once, as it seems so to militate against every-day knowledge. It will, however, gradually show itself in the systematic color-teaching which is here argued for. Practical illustrations in our schools would much more readily prove this statement."

The Names of Colors. — Only those names which are in common use should be given to primary children. Yellow, red, blue, orange, green, violet, purple, brown, gray, crimson, are quite sufficient for them.

The colored objects, whether colored cards, paper, worsted, or any other material, from which these color-names are learned, should be those which are known as standard colors. Great care should be taken, therefore, in selecting material for these lessons.

Tints, Shades, Tones, Scales. — The children can also learn the *tints* and *shades* of these colors, and ean learn to arrange them in *scales* of color.

Tints are those *tones* of a color lighter then standard color.

Shades are those *tones* of a color darker than the standard color, obtained by mixing black with the standard color.

A *scale* of any color is made by arranging its tints, standard, and shades in successive order from light to dark or from dark to light.

A *dulled* scale is made in mixing gray with all the tones of the scale.

Paints. — While the children are receiving color-sensations, and learning color-names by the study of colored objects, they can also begin to produce color-effects by the use of paints.

Beginning with yellow, red, and blue, they can learn, by mixing these colors, the results produced.

YELLOW and RED, mixed, make ORANGE.
YELLOW and BLUE, " " GREEN.
RED and BLUE, " " PURPLE.

The three mixed in varying quantities produce browns and grays.

At the same time, the children may try to make with the paints, colored pictures of colored objects, learning in the process not only color, but also something of the appearance of form. The objects given for this purpose should be carefully selected as to simplicity of form and color.

As the children learn to perceive different tints and shades of color in scales of color presented to them, they will also begin to discern the tints and shades of color produced on an object by light and shade, and will represent them in their color-work.

How to use Colors and Brushes. — The following directions for working with water-colors are taken from Prang's Color Boxes, and are given here for the guidance of teachers.

As to Colors. — With a brush full of clean water obtain the full strength of color from the cake, and then transfer it to the spaces in the cover of the box as to a palette. Add color or water as strength or delicacy of tint is required.

Rarely mix more than three colors, and do the mixing upon the palette and not upon the cakes. This is best practice at first, though after obtaining a good knowledge of color, and skill in handling, it is sometimes better to work directly from the cake, mixing in the brush.

As to Brushes. — Be careful to use clean water, that is, water not charged with much color by previous mixing; and always put the brushes and box away quite clean.

A hollow sponge held in the left hand is useful to remove superfluous color from the brush, thus keeping the water clean.

Do not leave brushes in the water or put them in the mouth. When ready to put the brush away, wash it thoroughly in clean water, and give it a quick shake; this removes the water, while bringing the brush to a point and preserving its shape.

As to Working. — Work from the left to the right, and from the top downward. Do not let the surface of the paper lie flat, but slope the lower part toward you.

Keep the brush full of color, and work generally with the side of the brush, using the point only for lines. Surplus color can be removed, if taken up quickly, by using a nearly dry brush, blotting-paper, or a soft rag.

Classification of Color. — As study in color progresses, a color nomenclature, based on the classification of color, becomes necessary. The scientist bases his classification on the study of the spectrum; the artist, on color effects produced by pigments.

Spectrum Colors. — A beam of light, passing through a glass prism, is refracted and decomposed, and when projected on a white screen is seen as a beautiful band of rainbow colors. This band is called the *solar spectrum*. The colors are so beautifully blended that it is hardly possible to determine where one ends and another begins. But the principal colors in the spectrum are generally spoken of as seven: *red*, orange, yellow, *green*, blue, indigo, and *violet*. The latest researches of science show that red, green, and violet are the *Primary* colors in the spectrum, — that is to say, they are the colors by the combination of which the other colors of the spectrum may be produced.[1]

In speaking of the colors of the spectrum, then, *red*, *green*, and *violet*, must be considered as *Primary* colors.

Pigment Colors. — But, in the use of such pigment colors as are now attainable, the mixing of colors does not produce the results reached by the combinations of the colors of the spectrum. The classification of the pigment-colors therefore for the present at least, must differ from that adopted for the spectrum-colors. In pigment colors, yellow, red, and blue are considered as *Primary* colors. By the combination of these Primary colors the Secondary colors, orange, green, and purple are produced, as has been already stated.

By the combination of Secondaries, Tertitaies are Producted. Each Tertiary contains all the Primary colors, with a double portion of one of them.

Secondaries.		*Tertiaries.*
ORANGE and GREEN	make	Citrine or Orange-green, named the Yellow Tertiary, as it contains red, blue, and a double portion of Yellow.
ORANGE and PURPLE	make	Russet or Orange-purple, named the Red Tertiary, as it contains yellow, blue, and a double portion of Red.
PURPLE and GREEN	make	Olive or Purple-green, named the Blue Tertiary, as it contains yellow, red, and a double portion of Blue.

There is in infinite variety of colors compounded from those mentioned, of which some are named and some unnamed. These must be left for more advanced study.

[1] Those desirous of investigating the subject for themselves will find some simple, but very interesting experiments in the combinations of the primary spectrum colors in No. 1 of Appleton's Experimental Science Series for Beginners, Light, by Alfred M. Mayer and Charles Barnard.

Harmony of Color. — The theories of the harmony of color, at present accepted, are based on the classification given above of pigment colors.

Each Primary harmonizes with its *Complementary*, which is that *Secondary* which contains the other two Primaries.

Primary.		*Secondary.*	*The other two Primaries.*
YELLOW	harmonizes with	PURPLE	made of RED and BLUE.
RED	" "	GREEN	" " YELLOW and BLUE.
BLUE	" "	ORANGE	" " YELLOW and RED.

The Secondaries and Tertiaries harmonize after the same law.

If a Tertiary-color is desired, harmonizing with a given Secondary, *orange* for example, recall the Primary with which orange harmonizes, which is blue: then the *blue* Tertiary, *purple-green*, will harmonize with orange. As red harmonizes with green, the *red* Tertiary, *russet* or *orange-purple*, will harmonize with green. As yellow harmonizes with purple, the *yellow* Tertiary, *citrine* or *orange-green*, will harmonize with purple.

The above may be summed up as follows: —

Yellow,	*Red,*	*Blue,*	***Primaries.***
Purple,	*Green,*	*Orange,*	***Secondaries.***
Citrine,	*Russet,*	*Olive,*	***Tertiaries.***

PURPLE	Strong contrast with Yellow. Subdued " " Citrine. In harmony with both.
GREEN	Strong contrast with Red. Subdued " " Russet. In harmony with both.
ORANGE	Strong contrast with Blue. Subdued " " Olive. In harmony with both.

It will be seen that harmony between Secondaries and Tertiaries is more subtle and delicate than between Primaries and Secondaries; as, for example, Green and Russet in combination are more pleasing to the eye and less crude in effect then Red and Green. Soft and delicate Grays add to the harmony of a picture; and tints of the Primaries in combination are more pleasing than the colors in their full strength.

A few simple Rules. — The most pleasing harmonies include the three Primary colors. (In these harmonies, unless the aim is for a scale of color, there is the least of yellow, more of red, and the most of blue. See pp. 27, 45, 75, 105.)

Better effects are produced, therefore, by the use of a Primary and a Tertiary than by the use of two primaries.

If combinations of a primary and a secondary are attempted, better results are generally reached by the use of tints and shades, or dulled colors (that is, mixed with gray) than with the standards.

These are the general principles on which the harmony of color is based. But in complete harmony, not only the colors themselves, but also the amount, balance, and quality of color must be taken into account. Into this broader field we cannot enter now.

Color Combinations. Practical Points in School Work. — The subject of Decoration calls especially for a knowledge of harmony of color. The study of Decoration begins in the primary schools with the attempt to make pleasing arrangements with solids, tablets, and colored paper. As soon as the element of color enters, training in the harmony of color should begin. The training at this early stage should be rather negative than positive; statements as to harmony of the different Primaries, Secondaries, and Tertiaries are not necessary.

But inharmonious combinations should be made impossible by the observance of the following rules by the teacher.

In choosing colored papers for use in the school-room, be careful first to get *Standard* colors; if you can, add to these, tints and shades of the various colors, so that scales of colors can be made.

At first, call for arrangements in standard colors, only one color to be used in any one arrangement — then for arrangements in tints, only one tint to be used in any one arrangement — then for arrangements in shades, only one shade to be used in any one arrangement.

Latter, when combinations are made, let them be —

(1.) { Of two tints of the same color.
Of two shades " " " "

(2.) { Of a standard with a neutral gray.
Of a tint " " " "
Of a shade " " " "

Do not call for or allow any combinations of (1) standard Primaries, (2) of Secondaries, (3) of Primaries and Secondaries.

If an object is represented by colored papers, do not allow any combination of two colors that would not be pleasing and suitable in the object.

If these rules are followed, the children will receive an unconscious training in the harmony of color; discords of color will seem glaring to them. In imitation, they will carry out harmony in their work with the brush.

To more advanced pupils, harmony of color can be taught on the classification given above.

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